TEMPERATURE VARIATIONS AND THEIR
RELATION TO GROUNDWATER FLOW,
SOUTH TEXAS, GULF COAST BASIN

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by

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THESIS

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ABSTRACT

TEMPERATURE VARIATIONS AND THEIR RELATION TO GROUNDWATER FLOW, SOUTH TEXAS, GULF COAST BASIN

by

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Isothermal surfaces and temperature gradients confirm the presence of anomalously high geothermal gradients along the Wilcox growth fault zone in South Texas. This anomaly has been attributed to the advection of heat via upwelling basinal fluids. However, there is also evidence that the same processes are occurring along the Vicksburg/Frio growth fault zones. Although a previous study showed a general increase in the temperature gradient to the southwest within South Texas, this study demonstrates that the trend is discontinuous. Shallow data suggest that advecting fluids are escaping from the compactional regime and perturbing the temperature field within the overlying meteoric regime.

This study enlarges the data base of Bodner (1985) by including temperature data of less than 200°F within the original study area and the entire range of temperature data to the south. Isothermal surfaces

produced at 50°F intervals from 100°F to 400°F indicate that beginning with the 150°F isotherm, a perturbation occurs at approximately 3500 feet to 4500 feet (1070 to 1370 m) along the Wilcox growth fault trend - well above the top of the geopressured, compactional regime. This perturbation suggests that advecting fluids are escaping from the compactional regime to the meteoric regime above. In addition, the isothermal surfaces show that the perturbation along the Wilcox growth fault trend becomes more prominent with depth. However, the isothermal surfaces do not show a perturbation along the Vicksburg/Frio growth fault trends.

Temperature gradients calculated within numerous subregions of the study area confirm the presence of temperature gradients as high as 3.4°F/100 ft (62.2°C/km) within the Wilcox growth fault zone. In addition, a contour map of temperature gradients within the compactional regime reveals the presence of higher temperature gradients (> 2.5°F/100 ft or 45.8°C/km) within the Vicksburg/Frio growth fault zones. This is the only thermal evidence that processes occurring in the Wilcox growth fault zone may also be occurring in the Vicksburg/Frio growth fault zones. Finally, a contour map of temperature gradients within the meteoric regime indicates that the highest gradients (> 2.0°F/100 ft or 36.6°C/km) occur roughly along the Wilcox growth fault zone. As with the 150°F isotherm, this suggests that advecting fluids are escaping from the compactional regime and perturbing the temperature field in the overlying meteoric regime.

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I. INTRODUCTION

Previous Studies

This thesis extends a previous study conducted at The University of Texas at Austin by Bodner (1985). Using bottom-hole temperatures (BHTs) from selected oil and gas well logs as a basis for the study, Bodner determined that regional processes are affecting the thermal patterns in the South Texas, Gulf Coast basin. Specifically, he showed that zones of anomalously high geothermal gradients exist subparallel with the coast and correlate well with the Wilcox and Vicksburg/Frio growth fault trends. Although the anomaly is most prominent in the Wilcox trend, where it increases significantly with depth, the geothermal gradients increase to the southwest across South Texas within both growth fault trends. In addition, data interpretation and model results indicate that the growth fault trend act as conduits for vertically moving fluids. Finally, Bodner's computer modeling supports the hypothesis that advection of heat by upward-moving fluids is causing the observed thermal anomalies.

Bodner's study has, in many ways, raised as many questions as it has answered. First, the anomalously high temperature gradients found in the Wilcox growth fault zone increase with depth. What is the cause(s) for this increase? Is the advection process more efficient at greater depths? Do meteoric waters damp out the anomaly at shallow depths? Second, is there a steady-state fluid flux up through the faults or is it transient in nature? Third, Bodner (1985) did not examine temperatures of less than 200°F in his study nor did the study area extend to the tip of Texas. Thus, the question arises as to whether the trends continue in the shallow subsurface or to the south. Finally, does other evidence (e.g. from pressure and chemical data) confirm or dispute the hypothesis developed by Bodner (1985)?

Objectives of Research

The objectives of this thesis were the following: 1) extend and refine the existing data base compiled by Bodner (i.e., collect temperature data of less than 200°F within the original study area and collect data over the entire range of temperatures within the remaining part of southernmost Texas), and 2) investigate the processes which are controlling the subsurface temperature field and its anomalies. This required the development and interpretation of isothermal surfaces and temperature gradients.

Study Area

The area investigated for this study includes both the original study area of Bodner (1985) and an extension to the southern tip of Texas (Fig. 1). The total area is approximately 26,000 square miles (67,600 square km). It includes all of Karnes, Bee, Goliad, Aransas, Refugio, San Patricio, Nueces, Live Oak, McMullen, Duval, Jim Wells, Kleberg, Kenedy, Brooks, Jim Hogg, Zapata, Starr, Hidalgo, Willacy, and

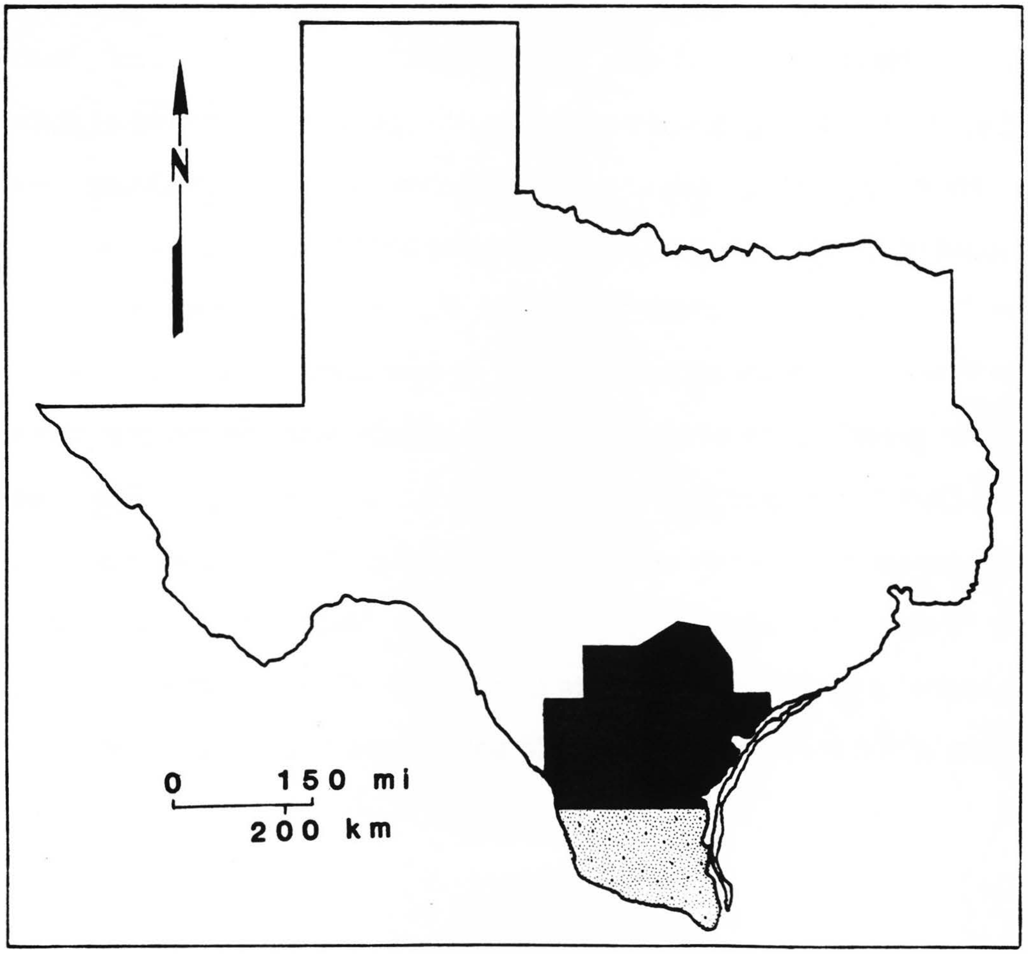


Figure 1. Map of the state of Texas showing Bodner's (1985) study area (in black) and the new extended area (stippled).

Cameron counties and parts of Webb, La Salle, Frio, Atascosa, Victoria, Wilson, and De Witt counties.

The coastal plain in which the study area is located has a subdued topography that dips 1-3^{o} toward the Gulf of Mexico. With respect to the stratigraphic framework, the area is composed of thick sequences of transgressive and regressive Tertiary and Quaternary terrigenous clastic sediment that were deposited in offlapping wedges over Cretaceous carbonate beds (Fig. 2). The structural framework within the study area includes bands of syndepositional listric normal faults or growth-faults which are oriented parallel with the regional strike of the Gulf Coast basin and with the Cretaceous shelf margin. The three major growth fault trends within the study area include the Wilcox trend (late Paleocene and early Eocene), the Vicksburg trend (early Oligocene) and the Frio trend (late Oligocene). Other structural features located within the study area include salt domes and shale diapirs (Fig. 3).

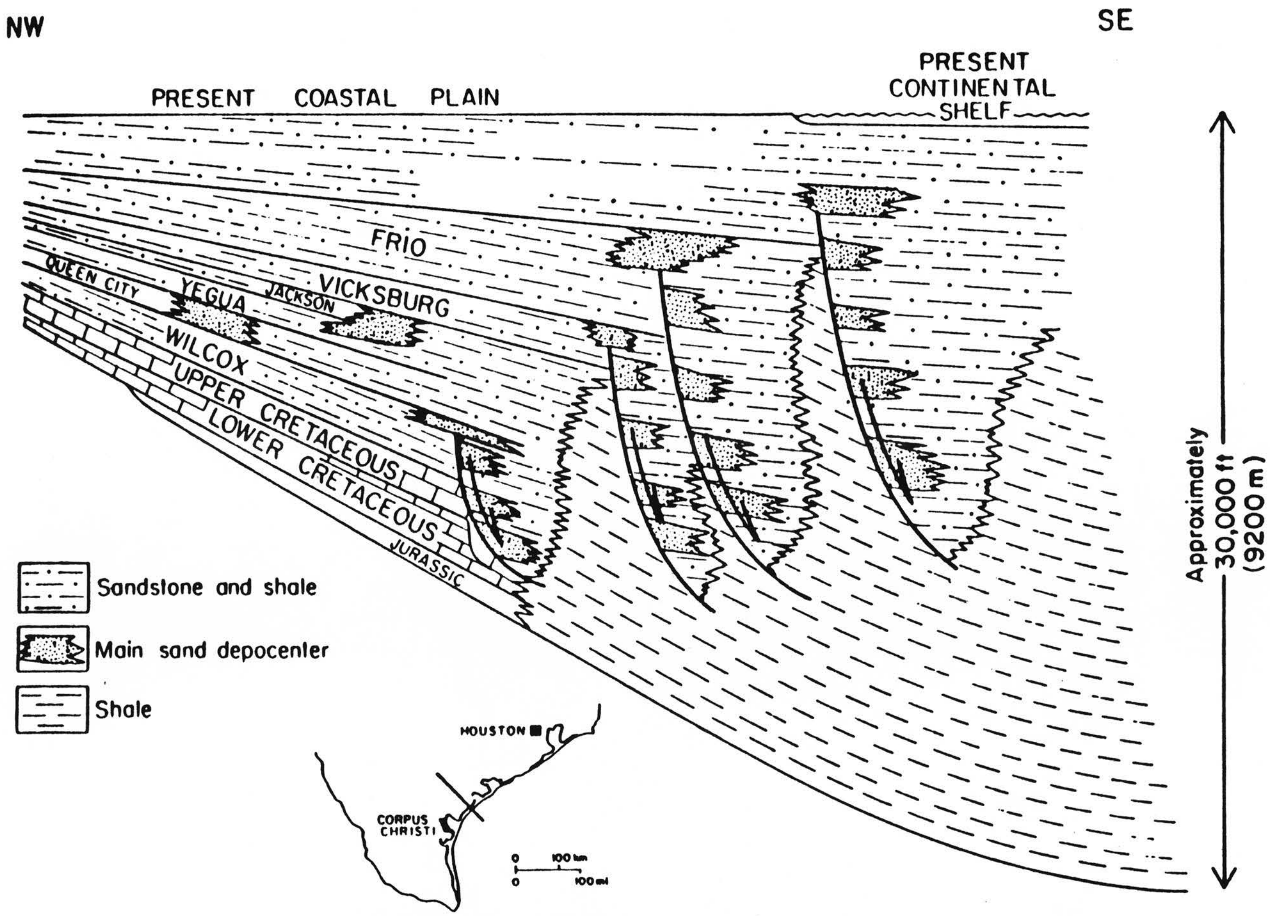


Figure 2. Cross section of the Tertiary sequence in South Texas. Geopressured sandstone reservoirs occur downdip of major growth faults (from Bebout and others, 1982).

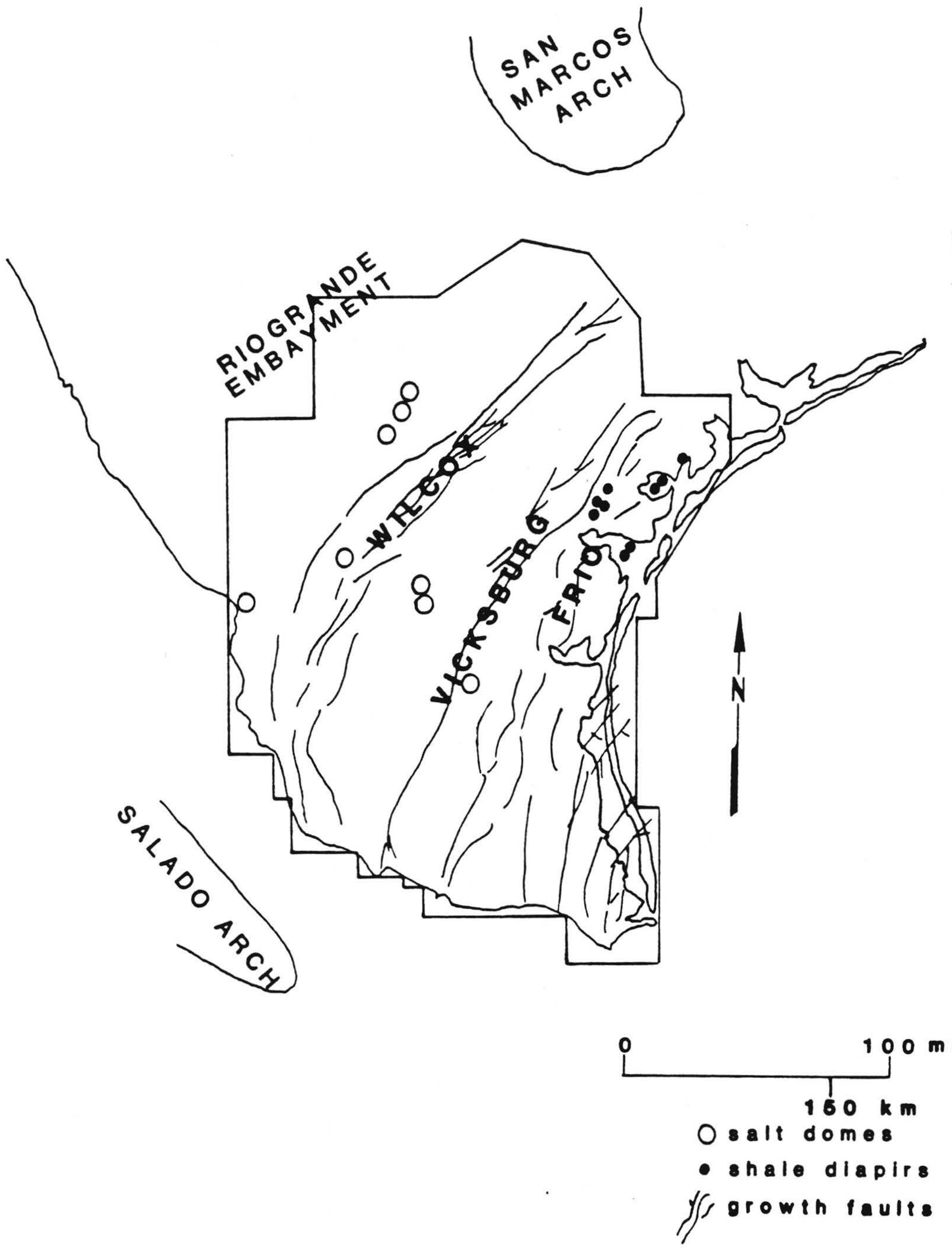


Figure 3. Tectonic map of South Texas with outline of study area (modified from Posey,1986 and Martin,1978).

II. BACKGROUND ON THE GULF COAST BASIN

Geologic History

Deposition of terrigenous clastics, carbonates and evaporites has been taking place in the Gulf Coast basin since early in the Mesozoic. The oldest sediments in the basin fill are Triassic in age and are confined to narrow grabens present in the basin and along its margin. Before Triassic time, the Gulf Coast basin area may have been a "shield" or land mass (Llanoria-Appalachia) which shed sediments into a bordering basin. Sediments which made up this shield include Precambrian and Paleozoic igneous and metamorphic rocks along with Paleozoic sedimentary rocks (Rainwater, 1967).

Initial rifting of Pangea in the Late Triassic resulted in the formation of grabens and the initial opening of the Gulf of Mexico basin (Stanley, 1986). Continued continental rifting in Early or early Middle Jurassic was accompanied by deposition of redbeds and anhydrite. As subsidence began in the Callovian (late Middle Jurassic), repeated flooding of the Gulf, by either the juvenile Atlantic Ocean, Pacific Ocean (Imlay, 1980; Stanley, 1986) or both (Pindell, 1985), and subsequent evaporation lead to the rapid deposition of initially continuous salt beds (Posey, 1986).

By the end of Jurassic time, normal marine deposition ensued as sea floor spreading allowed open marine circulation. This deposition continued into the Cretaceous as the Gulf of Mexico basin continued to expand. Although the Gulf Coast Region continued to subside during this time, sedimentation kept pace as most of the known Cretaceous sediments are richly fossiliferous and of shallow marine origin. Cretaceous deposits include mostly limestones and shales with some important reef developments (Dott and Batten, 1981).

Although Cretaceous sediments in the Gulf Coast basin are mainly carbonates, Cenozoic deposits are composed chiefly of terrigenous sands and shales with only minor carbonates (Dott and Batten, 1981). This change in deposition was a result of the Laramide Orogeny which was responsible for the tremendous amount of sediment shed from the rising land mass and deposited in the Gulf basin throughout the Tertiary and Quaternary.

In all, a maximum of 60,000 feet (18,300 m) of Mesozoic and Cenozoic sediment has been deposited in the Gulf Coast basin on a basement of pre-Mesozoic rocks. In addition, as much as 30,000 feet (9140 m) of sediment has been deposited on oceanic crust in the deeper parts of the basin (Seyfert and Sirken, 1979).

Thermal History

Heat sources which can alter the thermal regime of a region include rifting and/or seafloor spreading events and volcanism. The last tectonic event to affect the South Texas portion of the Gulf of Mexico basin was the opening of the Gulf of Mexico basin. Although rifting began in the late Triassic, seafloor spreading was delayed until the late

Callovian. The Gulf of Mexico's formation was completed by or during the earliest Cretaceous (Pindell, 1985) and the area has remained tectonically quiet throughout the Cenozoic Era (Stanley, 1986).

According to Nunn (1984), model results for the northern Gulf Coast margin predict that the most rapid change in the thermal regime occurred during the Jurassic and Early Cretaceous and that a constant temperature distribution has existed within the sediments for approximately the last 60 million years. Thus, the thermal anomaly which accompanied the rifting event in the Gulf Coast basin has completely dissipated.

Volcanic activity has occurred in or near the South Texas portion of the Gulf Coast basin as late as the Cretaceous and the Tertiary. More than 200 occurrences of igneous rocks of late Cretaceous age are known from South and Central Texas (Ewing, 1986). Most of these outcrops and subcrops are found in two different volcanic fields: the Uvalde volcanic field west of San Antonio and the Travis volcanic field near Austin (Fig. 4) (Ewing and Caran, 1982). However, the volcanic activity of the Late Cretaceous was small in volume and occurred over a long time span. Thus, any perturbation in the thermal regime as a result of the volcanic activity was very local in scale (D. Barker, personal communication, 1988). In the Early Tertiary during late Eocene time, volcanoes were active at times to the west of the study area in the Trans-Pecos region (Fig. 5). These nearby volcanoes were most active during the Oligocene; by Miocene time, volcanic activity had decreased

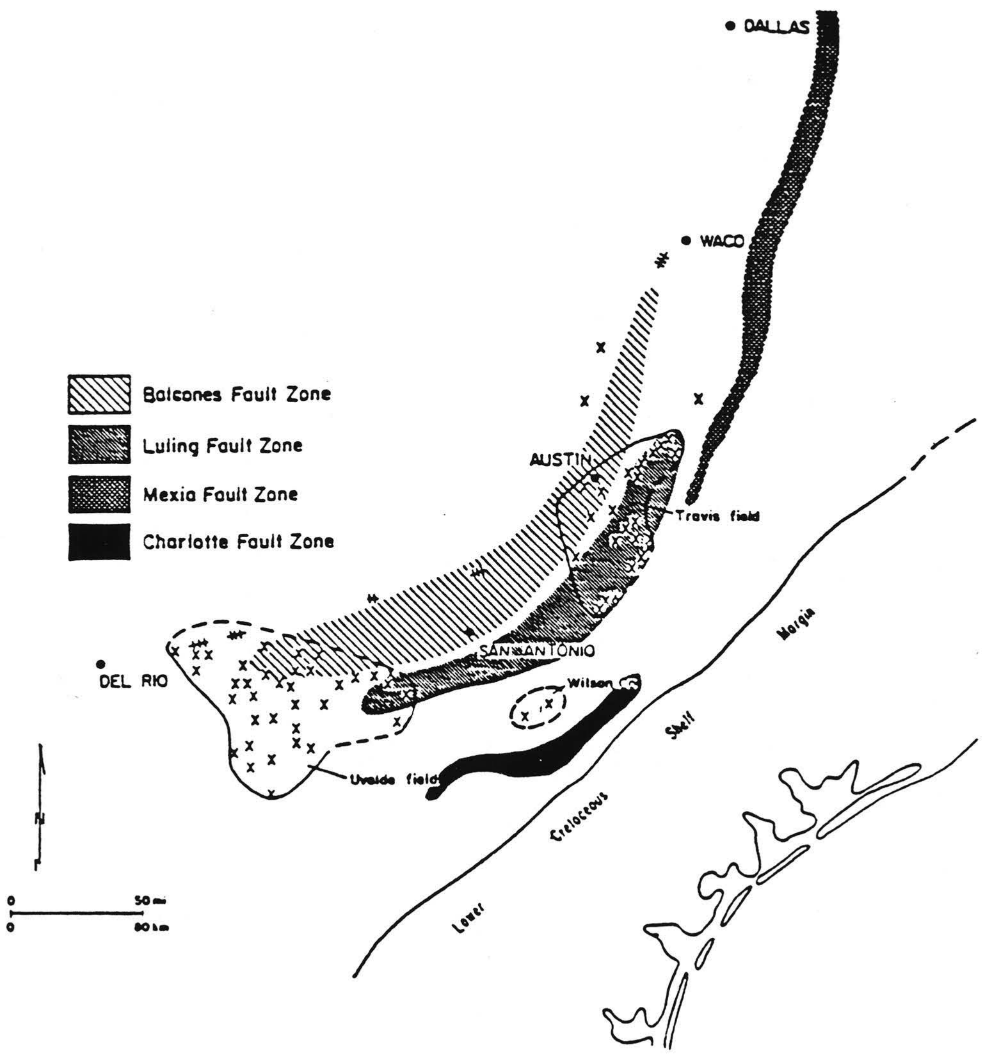


Figure 4. Location of the Uvalde volcanic field west of San Antonio and the Travis volcanic field near Austin (modified from Ewing and Caran,1982).

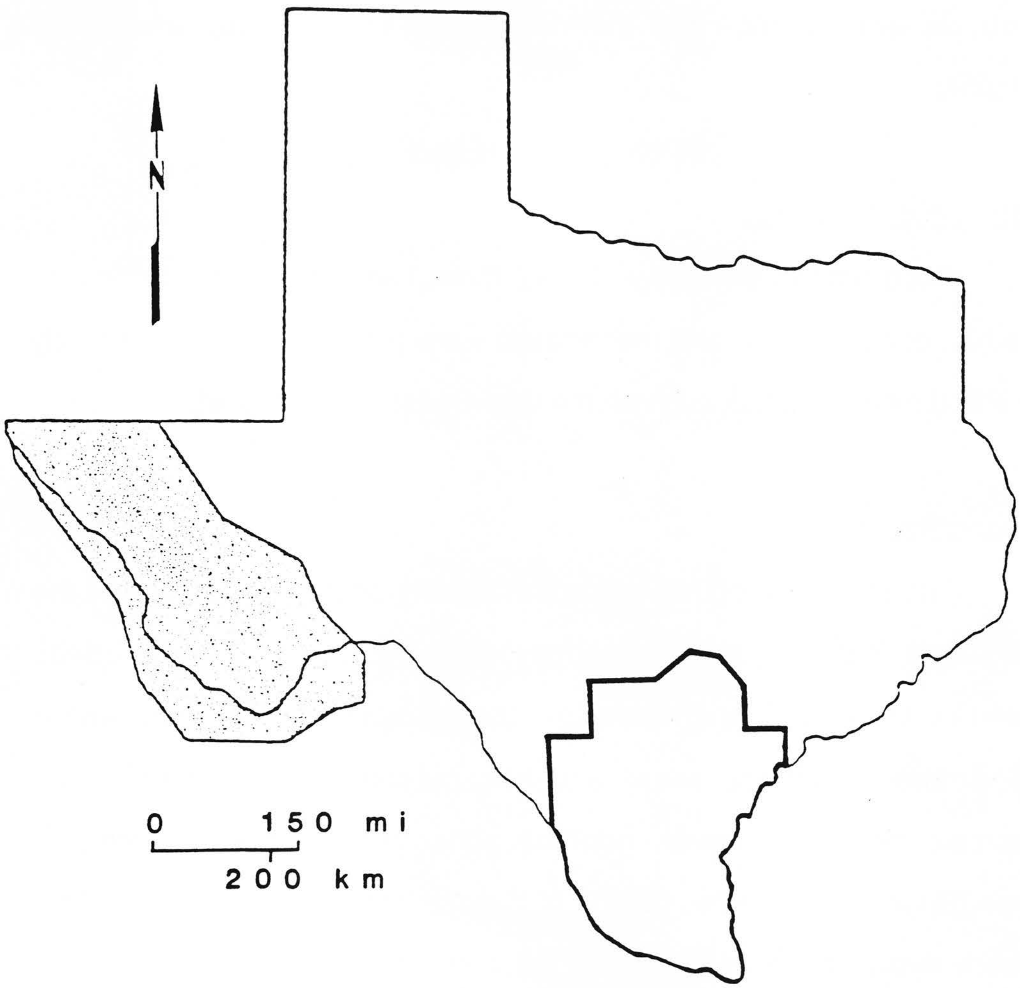


Figure 5. Location of Trans-Pecos region (stippled) in relation to the study area.

considerably (Henry and McDowell, 1986; Byerly, 1988). Because the nearest volcanic activity during the Tertiary occurred in the Trans-Pecos region, its effects upon the thermal regime in the study area were negligible.

Hydrologic Regimes

According to Galloway (1984), three basic hydrologic regimes - meteoric, compactional, and thermobaric - are present in a depositionally active sedimentary basin such as the Gulf Coast basin (Fig. 6).

Meteoric Regime

The meteoric regime encompasses the shallowest portion of the Gulf Coast basin. In this regime, meteoric water is defined as groundwater which originated at the ground surface as either precipitation or surface water and has recently been a part of the hydrologic cycle. However, connate water may also enter into this regime (Bodner and others, 1985). In general, the fluid pressure gradient is nearly hydrostatic (0.465 psi/ft or 10.5 kPa/m) and groundwater flows down the topographic gradient in the direction of decreasing gravitational potential energy. Although groundwater in the meteoric regime may become confined beneath less permeable sediment, the meteoric system eventually discharges via cross-formational flow at hydrologic boundaries such as rivers, lakes, and the Gulf of Mexico. In addition, groundwater flow within the meteoric regime is influenced by climate

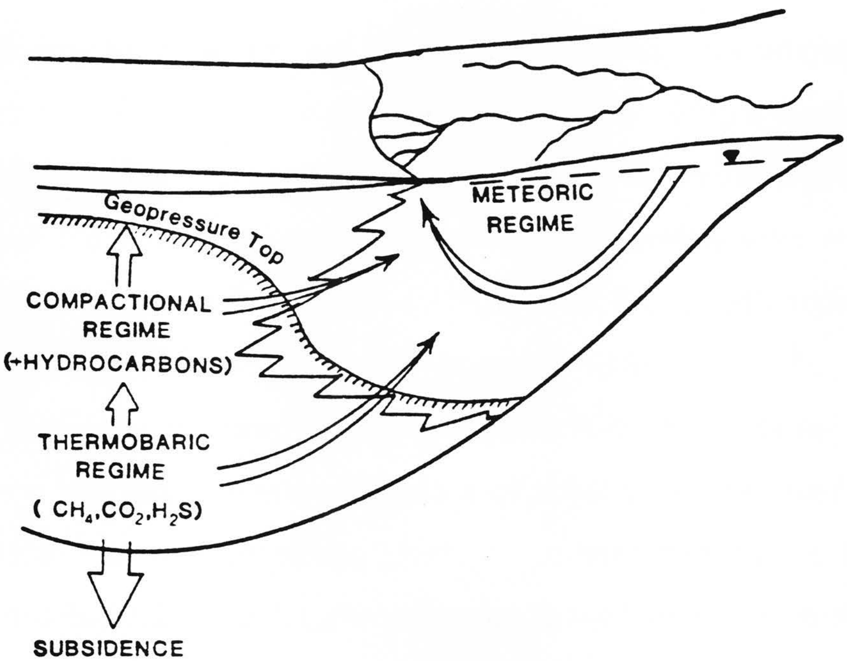


Figure 6. Generalized hydrogeologic model of a sedimentary basin (from Bodner,1985; redrawn from Galloway and Hobday, 1983).

which controls the amount of recharge to aquifers, and pumpage and injection (Fogg and Kreitler, 1982) which have significantly altered shallow flow systems in some areas.

Compactional Regime

Underlying and transitional to the meteoric regime is the compactional regime. Here, fluid movement is dominated by the upward and outward expulsion of pore waters within the compacting sediment pile. The pore waters consist chiefly of connate water, but meteoric water trapped below the zone of active meteoric circulation may also be present (Galloway, 1984). Because of the large volume of shales with low permeability in the Gulf Coast basin, the upward movement of fluids is often retarded. This leads to a sharp increase in the fluid pressure gradient above hydrostatic. In fact, gradients may approach the lithostatic pressure gradient or approximately 1.0 psi/ft (22.6 kPa/m) (Fig. 7). This increase in pressure above hydrostatic is called geopressure, also known as overpressure or excess pore-fluid pressure. Geopressure has often been associated with higher geothermal gradients especially in shales with low thermal conductivities (e.g. Jones, 1970). In addition to trapped pore waters, other mechanisms that have been attributed to geopressure include aquathermal pressuring (Barker, 1972), mineral phase transformations (Burst, 1969; Bruce,1984) and hydrocarbon maturation (Hedberg, 1980).

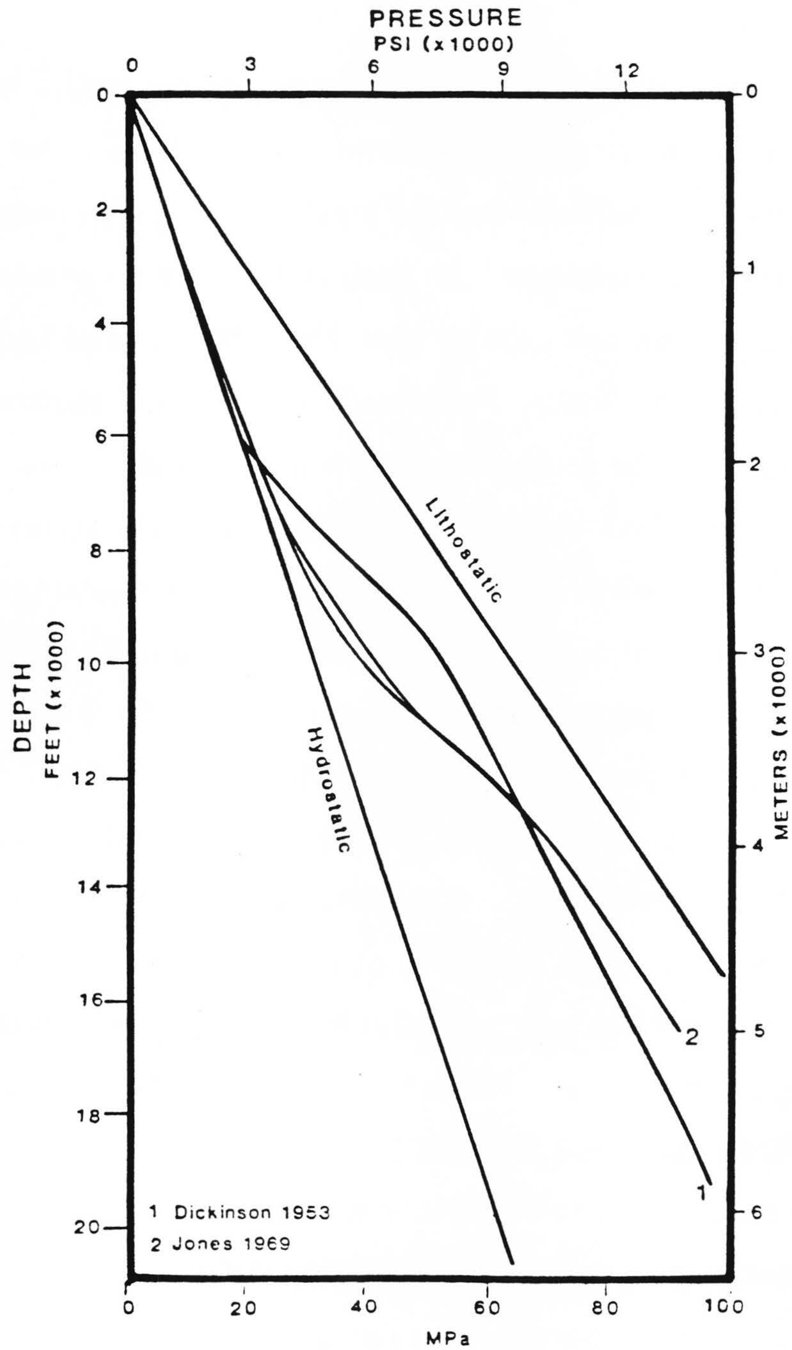


Figure 7. Graph of variations in pressure vs. depth within the Gulf Coast basin (from Bodner, 1985).

Thermobaric Regime

Underlying and transitional with the compactional regime is the thermobaric regime, which encompasses the deepest parts of the Gulf Coast basin. Here, the temperatures and pressures are great enough to cause low-grade metamorphism. In fact, metamorphism should be occurring in rocks below and possibly even above the Jurassic Louann Salt (Sharp and others, 1988). Fluid movement is limited because of low permeability within the compacted sediments (Galloway, 1984). The major hydrologic process in this regime is probably the release of metamorphic fluids (Sharp and others, 1988). This is supported by "evidence from field, analytical, and experimental studies which indicates that substantial volumes of an aqueous fluid phase are present during most metamorphic processes" (Norris and Henley, 1976, p. 333). One mechanism which may account for the large quantities of water released in otherwise low permeability rocks is hydraulic fracturing induced by thermal expansion of water. However, according to specific volume curves for water, water loss may only occur by this mechanism for linear temperature gradients greater than 0.66°F/100ft (12°C/km) at depths greater than 16,400 to 32,800 feet (5,000 to 10,000 m). During burial at lower gradients, water is retained in the sediment and may cause widespread metasomatism (Norris and Henley, 1976). One possible source for water available to be released is its production by metamorphic reactions (e.g., the conversion of mixed illite-smectite to muscovite). The reaction for the conversion from illite-smectite to muscovite is:

$$6\ Ca\ K\ Al_3\ Mg\ Si_7\ Al\ O_{20}(OH)_4 + 4\ K^+ + 14\ H^+ \rightarrow$$

$$3\ K_2\ Al_4\ Si_6\ Al_2\ O_{20}\ (OH)_4 + 3Ca^{++} + 6\ Mg^{++} + 12\ H_2O + 24\ SiO_2$$

Although several mechanisms have been proposed to account for the large quantities of fluids released in the thermobaric regime, it is unknown how these fluids influence basinal processes because direct sampling has not yet been done (Sharp and others, 1988).

Free Convection

In addition to the meteoric, compactional and thermobaric regimes, free convection may be occurring in the Gulf Coast basin. With free or thermal convection, fluid motion is caused by density differences which are created by the temperature differences existing in the fluid mass and/or salinity changes which result from salt dissolution or reactions which release water (Sharp and others, 1988). In addition, because temperature increases with depth in the water-saturated porous layer and the viscosity of water is strongly temperature dependent, there is a decrease in viscosity with depth (Sharp and others, 1988). This reduction in the dissipative effects of viscosity can lead to instability of the layer and because the layer would be most unstable near the bottom, convective motions can penetrate upward into what might otherwise be locally stable regions (Straus and Schubert, 1977). In contrast, forced convection, or advection, is the transfer of heat by a medium such as water moving in response to an external force field.

The most likely area of occurrence for free convection in the Gulf Coast basin is in the Frio Formation (Blanchard and Sharp, 1985). Evidence for this occurrence includes: 1) Rayleigh number calculations, 2) Frio water geochemistry data, 3) horizontal and vertical thermal patterns in the Frio, and 4) observed diagenetic patterns in Gulf Coast sediments which require large volumes of fluid (J. Sharp, personal communication, 1988).

With respect to Rayleigh number calculation, the feasibility of free convection in a porous media can be determined using a stability criterion known as the Rayleigh number (Ra) where:

$$Ra = \frac{g \rho \alpha (\rho c)_f k \Delta T H}{\mu \lambda^*}$$

g = gravity

$(\rho c)_f$ = volumetric heat capacity of the fluid

k = intrinsic permeability

ΔT = temperature difference across the layer

λ^* = thermal conductivity of the porous medium

ρ = density

α = thermal expansivity

H = layer thickness

μ = fluid viscosity

Thus, the critical Rayleigh number-the minimum number needed to allow free convection-is $4\pi^2$ for conditions where a horizontal layer exists with isothermal, impermeable, upper and lower boundaries (Blanchard and Sharp, 1985; Sharp and others, 1986). However, according to Aziz and others, (1973), Rayleigh numbers of 12 to $4\pi^2$ correspond to the most reasonable boundary conditions for geologic settings with nearly horizontal strata. Blanchard and Sharp (1985) calculated Rayleigh numbers for a variety of thicknesses, depths, and thermal gradients within the Gulf Coast basin. Reasonable values were selected and thermal parameters were allowed to vary with temperature. They concluded that critical Rayleigh numbers were exceeded for thick sandstone sequences, such as the Frio, which supports, along with other evidence, the theory that free convection may be occurring in the Frio Formation.

A second line of evidence for free convection in the Frio Formation involves geochemistry data for Frio waters throughout the Texas Gulf Coast which show that less dense and, consequently, hotter waters are highly oversaturated with respect to silica, while more dense, cooler waters are closer to equilibrium (Blanchard and Sharp, 1985). Specifically, according to Land (1984), the following sequence occurred in the chemical diagenesis of Frio sandstones. At some point basinal shales were heated to approximately 176-212°F (80-100°C). Release of CO_2 from organic maturation in the more deeply buried shales resulted in the mobilization of $CaCO_3$ in some Frio shales. In addition,

SiO_2 was released from underlying sediments and as a product of the smectite-to-illite transformation. As a result, quartz and carbonate-charged pore waters were expelled into the sands. Moving upward, the water deposited calcite and quartz cements in the sandstones of the Frio, and then cooled, lost CO_2 and mixed with more ^{18}O-depleted sea water, or possibly even meteoric water. Thus, free convection may have been the mechanism by which these quartz and carbonate-charged waters moved upward through Frio sands.

A third line of evidence involves the horizontal and vertical thermal patterns within the Frio Formation. According to Blanchard and Sharp (1985, p. 6), the "areal distribution of thermal gradients within a Frio reservoir (West Ranch Field, Texas) exhibits a geometric pattern completely consistent with Benard-type convection cells - central upward-moving heated plumes surrounded by polygonal zones of cooler, down-flowing fluids". In addition, vertical geothermal gradients indicate that free convection may be occurring in the Frio Formation.

Finally, the possibility of free convection in the Frio Formation is suggested by the vast number of pore volumes of water needed to cement Frio sandstones (Sharp and others, 1988). Land (1984) calculated this number to be on the order of 10^4 pore volumes. Neither meteoric nor compactional waters are capable of supplying such a vast amount of water. However, recirculation in the form of free convection is one way in which that many pore volumes could be flushed through sediments (Sharp and others, 1988).

Thermal Regime

Geothermal gradients in sedimentary basins generally range from 0.8-2.7°F/100 ft (15-50°C/km). However, the typical value is 1.6°F/100 ft (30°C/km) (North, 1985). By comparison, geothermal gradients of 0.8-1.6°F/100 ft (15-30°C/km) prevail over most of the Gulf Coast basin area (Fig. 8). In general, geothermal gradients are highest in the thinner, onshore sediments and decrease seaward toward areas of more recent and/or rapid deposition (Bebout and others, 1982). In fact, according to Bodner and others (1985), the gradients change from 2.7°F/100ft. (50°C/km) in the inner coastal plain to 1.1°F/100ft (20°C/km) in offshore sediments.

A model proposed by Sharp and Domenico (1976) might account for the increasingly cooler sediments seaward because it successfully reproduces the low temperatures and gradients observed. According to these authors, offshore sediments presently contain maximum pore-fluid pressure and minimum temperature at any given depth as a result of rapid deposition, which has not allowed offshore sediments enough time to thermally equilibrate. However, once the offshore sediments are uplifted and exposed to erosion, excess pressures within will bleed off and lower pressures and higher temperatures will prevail as they do in older inland sediments in the Gulf Coast region.

In the Gulf Coast basin the geothermal gradient changes not only with direction but also with depth. Gradients in the hydropressured

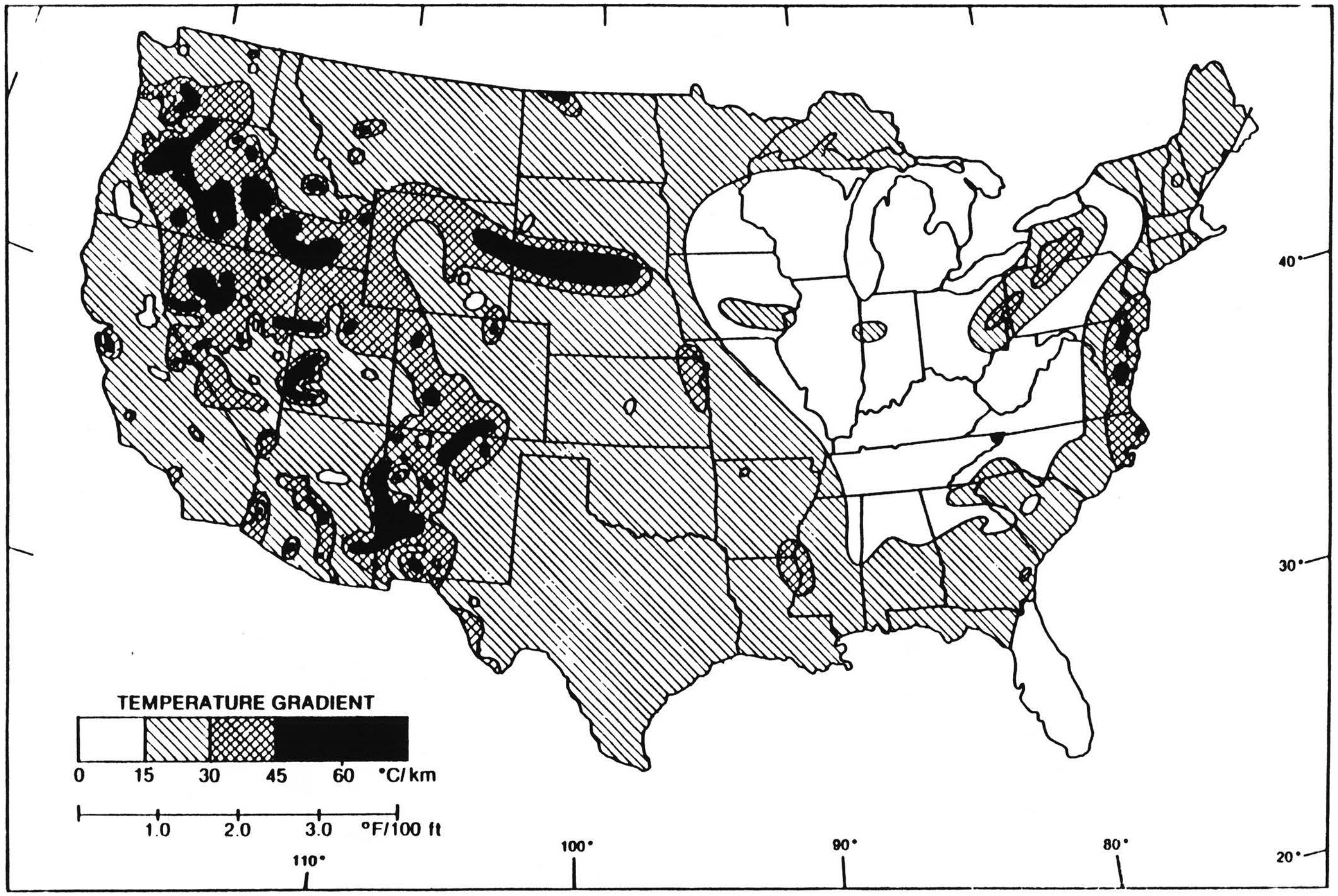


Figure 8. Geothermal gradients in the U.S.A. (from Jorden and Campbell, 1984).

zones typically range from 1.5-2.0°F/100ft (27-36°C/km) except in the cooler areas offshore. However, geothermal gradients increase to 2.0-3.0°F/100ft (36-55°C/km) at depths which often correspond closely to the occurrence of geopressuring (Bebout and others, 1982). The increase in the geothermal gradient within the geopressured zone is generally presumed to be the result of less compacted, more porous, and thus, lower thermal-conductivity shales (Bodner and Sharp, 1988). However, the thermal anomalies which are present along the Wilcox growth fault zone, both above and below the top of geopressure, appear to be the result of advecting fluids moving up the growth faults (see Chapter IV).

In addition to regional anomalies such as the Wilcox growth fault zone, local anomalies of the thermal regime occur near salt domes. Temperature gradients near the top of a salt dome and around its perimeter are higher than average (Bodner and others, 1985). Although this is commonly attributed to the higher thermal conductivity of salt than other sediments (Guyod, 1946), Keen (1983) calculated that thermal anomalies in the Scotia Basin on the Nova Scotian continental margin could not be accounted for by thermal conductivity differences alone and concluded that advection caused by groundwater flow moving up the flanks was responsible. However, only eight known salt domes are present in the study area (Fig. 3) and there is currently no information as to how much fluid flow is occurring along the flanks of these domes (S. Seni, personal communication, 1988).

Local anomalies of the thermal regime also occur where growth faults vary on a local scale. Both fluid flow movement along isolated permeable sections of a growth fault and variations in thermophysical parameters (e.g. thermal conductivity) from one fault block to another can cause these anomalies (Bodner and others, 1985).

III. DATA COLLECTION AND PREPARATION

Data Collection

Data for this study came directly from oil and gas well log headers purchased by the Bureau of Economic Geology. All logs available for the study area were examined but only logs which could be read and contained the necessary information were used. However, some logs did not have ground level information but were located in areas where data were badly needed. Scout tickets were used to find many of these ground elevations. Also, a few were found by interpolation or extrapolation of the ground elevations on a base map. The remaining logs for which ground elevations could not be found were discarded. Thus, information gleaned from each well log header included ground elevation (if available), depth(s), bottom-hole temperature taken at each depth, and time since circulation stopped before the bottom-hole temperature was taken (if available). An arbitrary well identification number was assigned to each well and a cross reference between the well identification number and the name of the well is given in Appendix A.

Two computer files were generated on the Control Data Corporation Dual Cyber 170/750 Computer (CDC) using the information gathered from the well log headers. The first computer file contained information from 671 wells in Bodner's original study area where temperatures of less than 200°F were recorded. The second computer file contained information from 1038 wells located in the new study area (Fig. 1). The listing for each well contained the well identification number, ground elevation, and depth/temperature/time since circulation pairs. After the computer files were generated, location coordinates were found for each of the wells. This was accomplished using a digitizing tablet and CPSPC software at the Bureau of Economic Geology. Maps showing the locations of wells were placed on the tablet and the locations were digitized by manually placing the cursor over each of the selected wells. Because the programs used later to analyze the data require a cartesian mapping system, the location coordinates for this study were generated using the Universal Transverse Mercator mapping system. For more information on this mapping system, see Merrill, 1986. After the well locations were digitized, the location coordinates were added to their respective wells in the computer files.

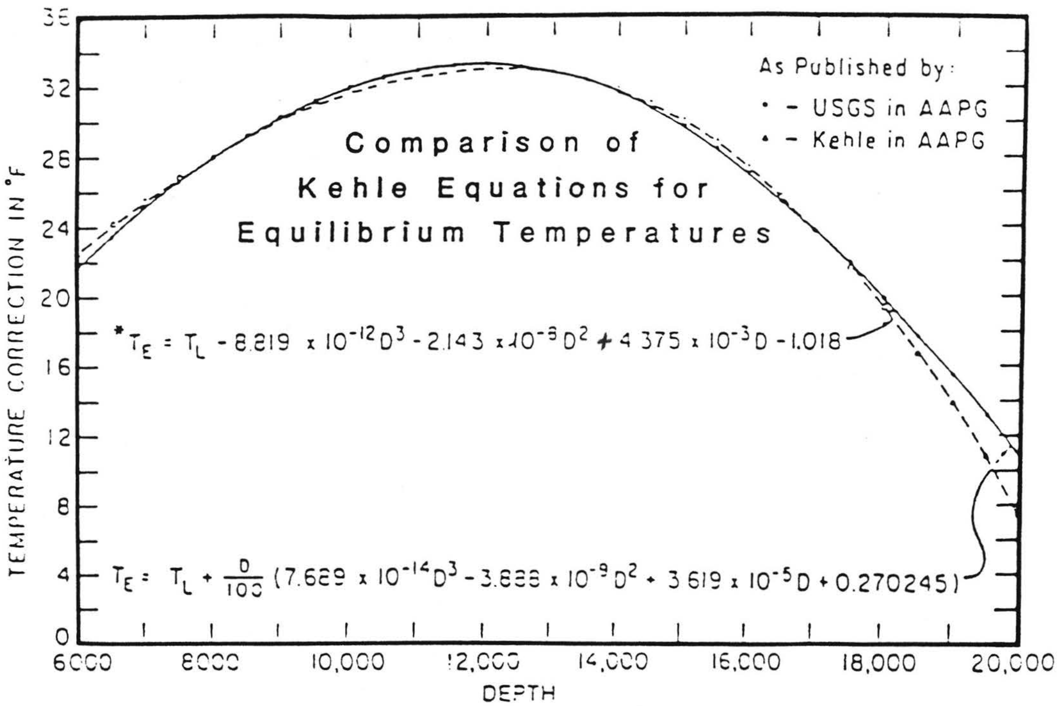
Temperature Correction

Once the depth/bottom-hole temperature pairs and their location coordinates were entered into computer files, it was necessary to look at ways of "correcting" the bottom-hole temperatures. This correction is needed because circulating fluids in the borehole (which condition the hole prior to logging operations) bias the measured bottom-hole temperature to some tens of degrees Fahrenheit (^{o}F) lower than true, static formation temperature (Fertl and Wichmann, 1977; Roux and others, 1980; Glaser and Hurtig, 1984).

Several different temperature correction methods are given in the literature including Kehle (1971), the Horner plot (Dowdle and Cobb, 1975; Majorowicz and others, 1984; Chapman and others, 1984; Archer and Wall, 1986; Fertl and Wichmann, 1977), Roux and others (1980), and Middleton (1979). The Kehle method was used to correct all of the temperature data. Appendix C gives a description of each of the alternate temperature correction methods, reasons for using the Kehle method, and suggestions on how to make a comparison between the different methods.

Kehle Temperature Correction Method

The Kehle temperature correction method is an empirical formula which was developed by comparing well log and equilibrium bottom-hole temperatures of 602 selected West Texas and Louisiana wells. The well log temperature was subtracted from the equilibrium temperature and the difference was plotted as a function of depth. A polynomial was fitted to these data using a least square error criterion. Figure 9 shows the equation and its plot. Because the Kehle correction calculates the true formation temperature only as a function of depth it can be used to correct all depth/temperature data. However, the fact that the Kehle method corrects the bottom-hole temperature only as a function of depth is also its limitation (i.e., the Kehle correction does not take into account other variables such as circulation time or the time since circulation stopped before the bottom-hole temperature was taken).



where T_E = temperature at equilibrium

T_L = temperature recorded

D = depth

Figure 9. Equation (shown with asterisk) for the Kehle temperature correction method (from Bodner, 1985).

Thus, the Kehle correction may give a static temperature that may be lower than the true formation temperature. Nevertheless, the Kehle method was used: 1) to maintain consistency with other analyses (e.g. Bodner, 1985), 2) because corrected temperature data are considered to be more accurate than uncorrected temperature data, and 3) because other methods of temperature correction could not be used (see Appendix C).

Data Manipulation

After the temperature correction, the data in the two computer files were combined with the data used in Bodner's study. The resulting data file contains 5,271 depth/temperature pairs from 2,271 oil and gas wells and is listed in Appendix B. With this listing, each line represents information from one well. The temperatures have been corrected with the Kehle method and depth data are converted to depths relative to sea level. Figure 10 is a map of the well density in the study area.

One objective of this study was to construct isothermal surfaces in order to examine thermal variations in the subsurface. For this purpose, the data file was subdivided by interpolating and extrapolating the depth data to temperatures ranging from 100°F to 400°F at intervals of 50°F. This was done using the following equations for interpolation

$$Z_{iso} = \frac{(Z_2 - Z_1) \times (T_{iso} - T_1)}{(T_2 - T_1)} + Z_1$$

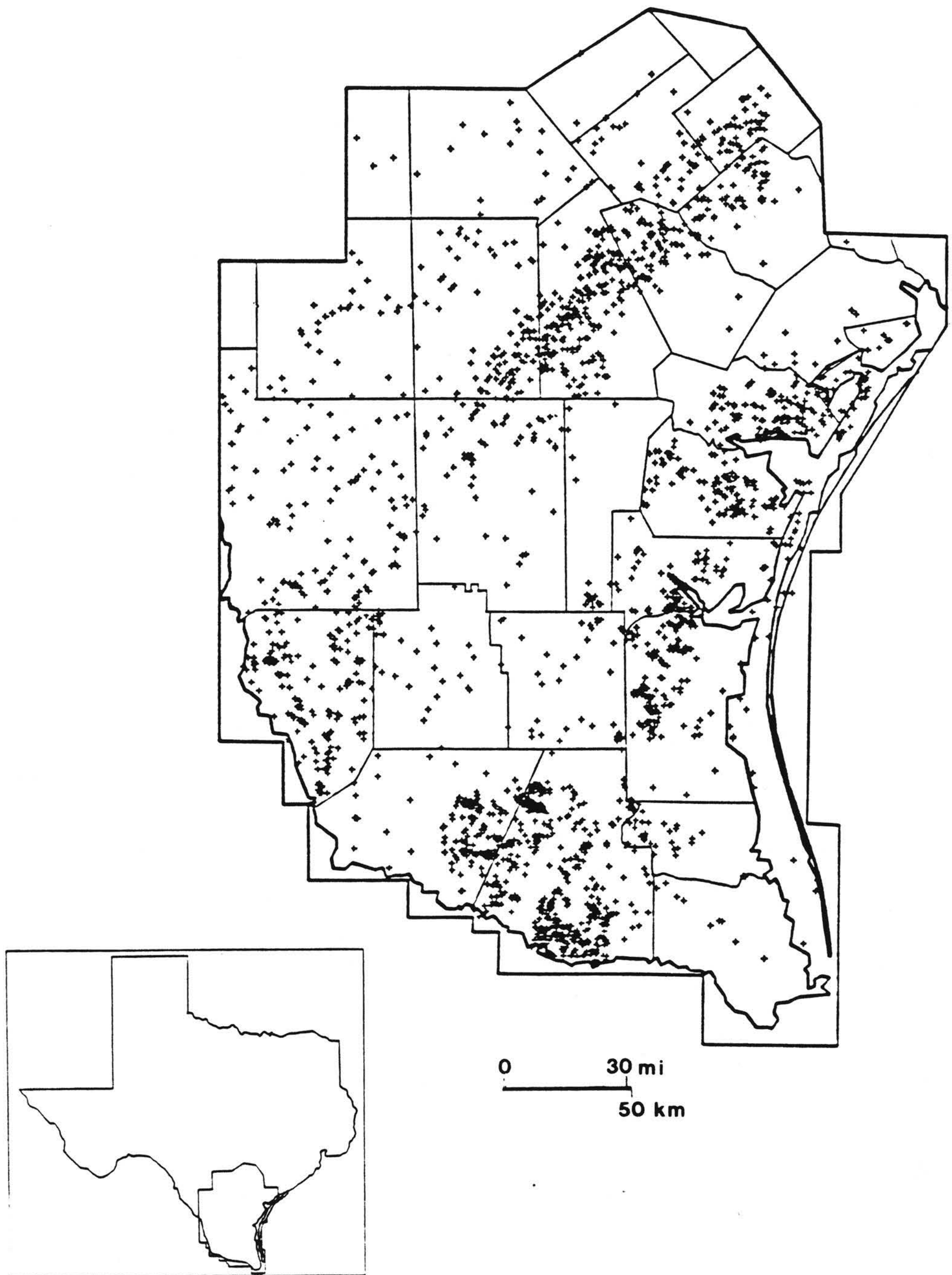


Figure 10. Map of study area showing distribution of well log data.

and extrapolation

$$Z_{iso} = \frac{T_{iso} \times Z_1}{T_1}$$

where Z_{iso} = isotherm depth

T_{iso} = temperature of the given isotherm

A program written by Bodner (1985), his Appendix C, and slightly modified for this study was used to create a data file for each isothermal surface. Because the temperature gradients in the Gulf Coast basin change with depth, the temperature ranges used in the program were fairly narrow in order to limit the amount of interpolation and extrapolation. For the 100°F, 150°F, 200°F, 250°F, and 300°F isotherms, the temperature range was 30°F. However, for the 350°F and 400°F isotherms, the temperature range was 50°F because of smaller data sets.

Finally, once the data files were created for each of the isotherms, the geostatistical method of kriging was used to eliminate data scatter, smooth out the data to be contoured, and quantify the uncertainty. Kriging transforms uneven or irregularly spaced points into evenly spaced points on a grid. Each point on the grid is estimated from the actual data points surrounding it. However, this is not a simple average. Instead, each grid point is found by a weighted average of the surrounding points (i.e., actual data points close to the grid point have more influence on the value of the grid point than those farther away). In addition to finding grid point values, kriging calculates the standard deviation at each of the grid points. For more information on kriging, see Knudsen and Kim (1978) or Bodner (1985), his Appendix D.

IV. THERMAL VARIATIONS

Isotherms

Well location, three-dimensional surface, contoured surface, and standard deviation maps were made for each of the seven isotherms (Figs. 11, 13-18). These maps were constructed using Radian Corporation's CPS1 graphics program.

With the 100°F isotherm (Figs.11a-11d), the three-dimensional surface and contoured surface maps give no indication that the isotherm is influenced by growth faults (Fig. 12) or other subsurface structural features. Instead, the 100°F isotherm, which was created from 167 data points, appears to be controlled by shallow meteoric circulation as evidenced by a northwest-southeast pattern which coincides with the regional hydraulic gradient toward the coast. In fact, the contour map (Fig. 11c) shows that the depth to which the 100°F isotherm occurs is shallowest in the west and deepest in the east and southeast of the study area. This pattern is explained by Sharp and Domenico (1976) as the result of rapidly deposited offshore sediments which have not had time to thermally equilibrate. A model proposed by the authors successfully reproduces the low temperatures and gradients observed and Sharp and Domenico (1976) state that with time, higher temperatures will prevail in the offshore sediments as they do in older onshore sediments (see page 21). In addition, because of the shallow depths (800-2,200 feet or 240-670 m) at which the 100°F isotherm occurs, the isothermal surface is

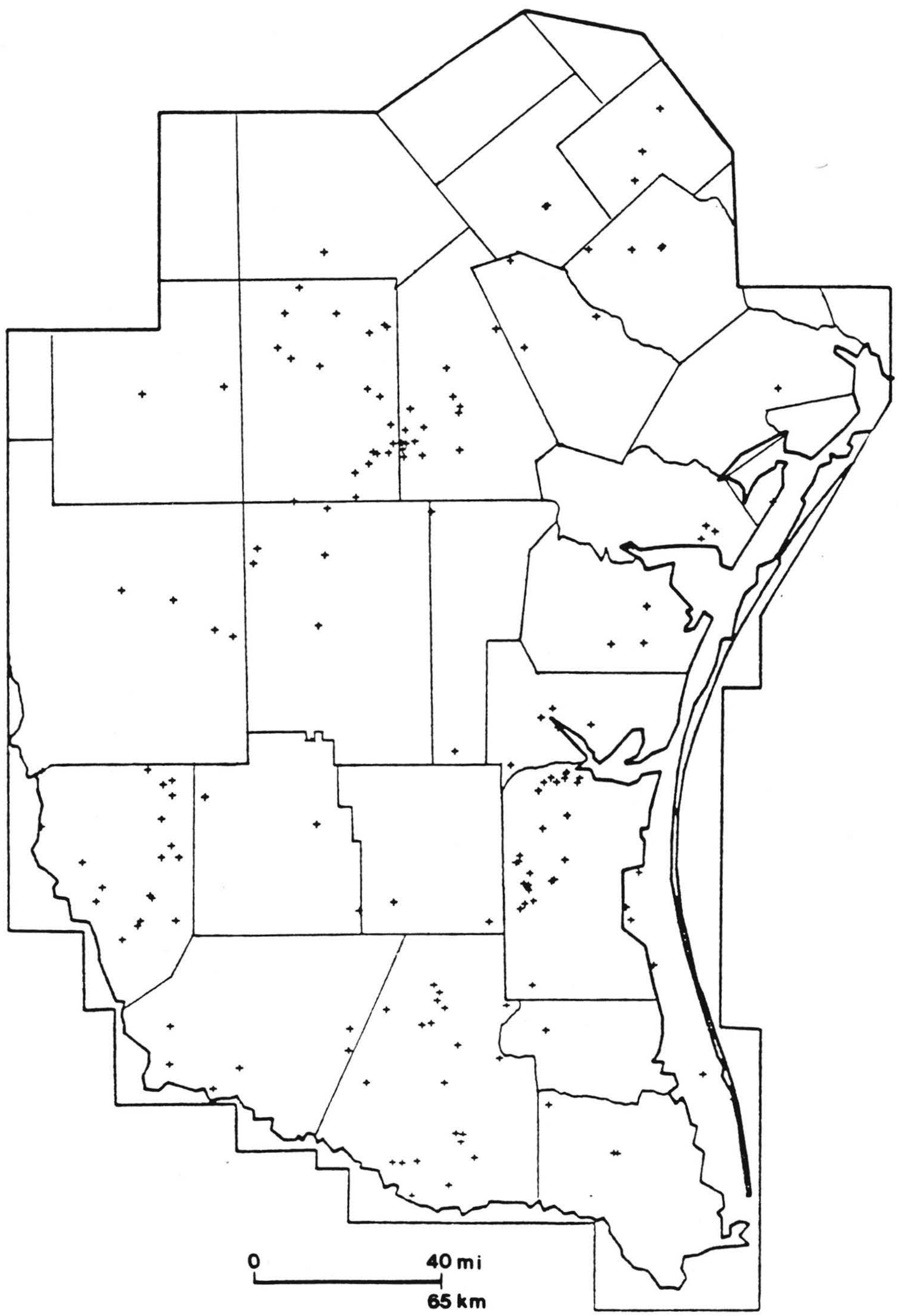


Figure 11a. Well location map for the 100°F isotherm.

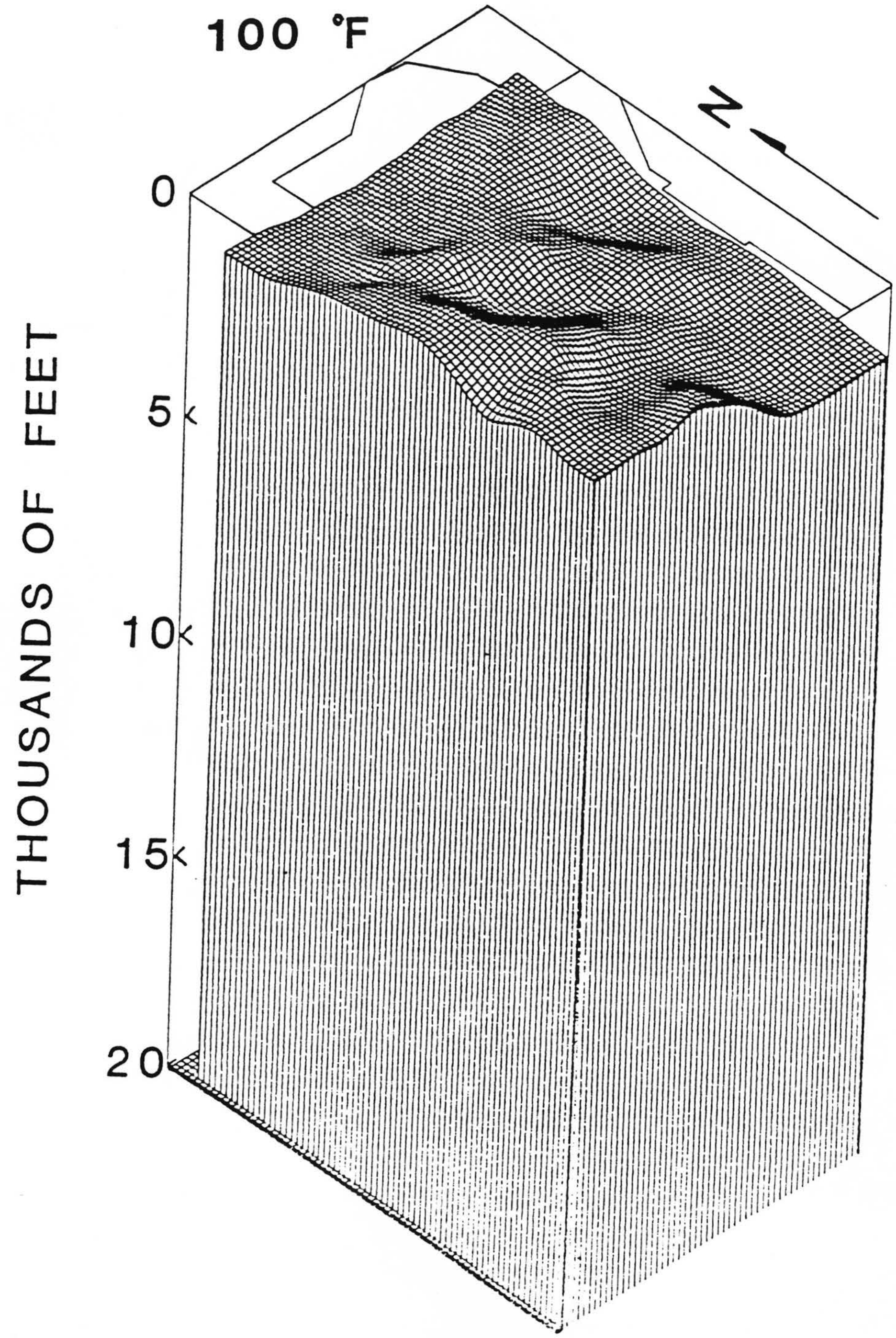


Figure 11b. Three-dimensional surface of the kriged 100°F isotherm with the study area projected above it.

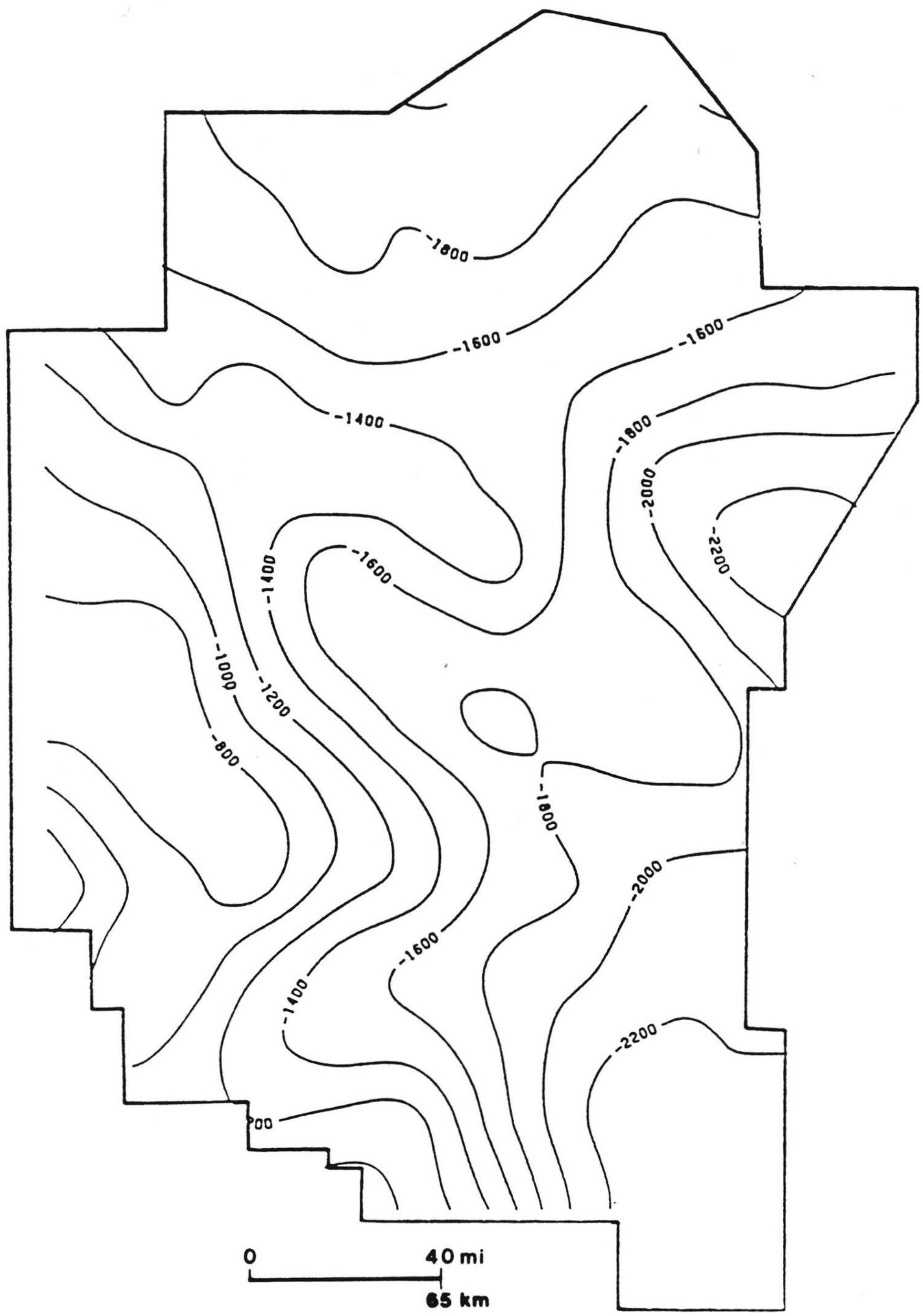


Figure 11c. Contour map (in feet) of the kriged 100°F isotherm.

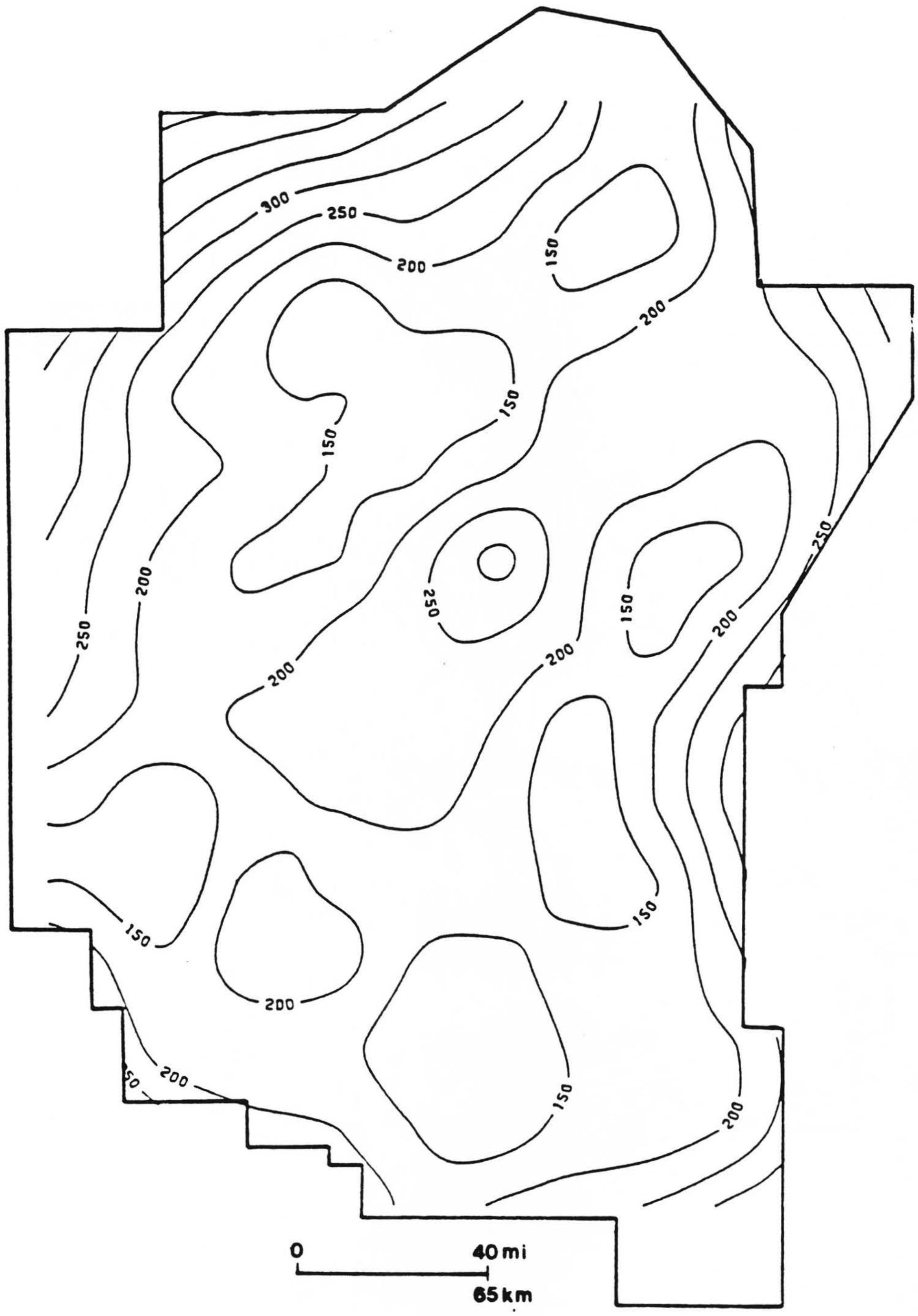


Figure 11d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 100°F isotherm.

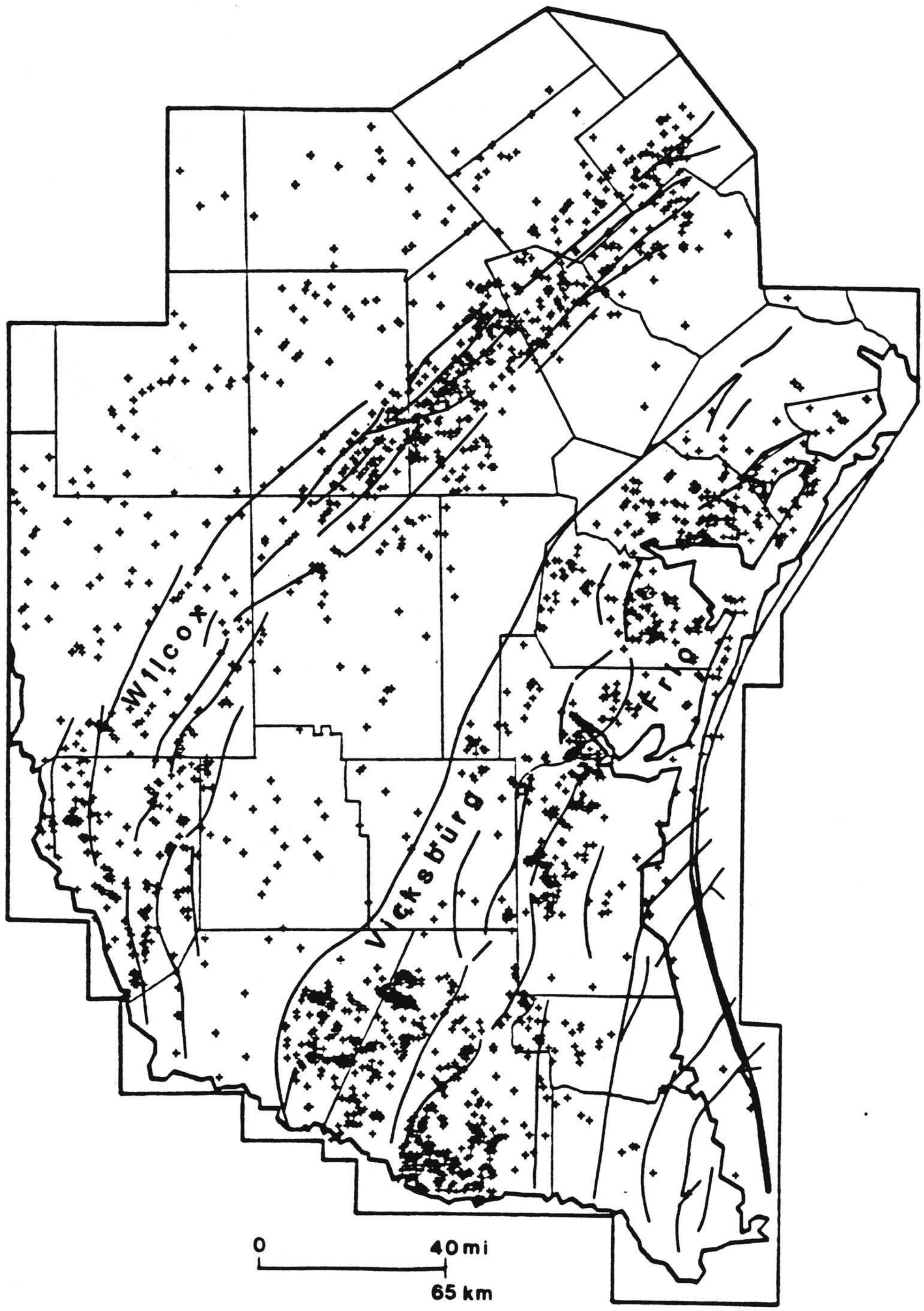


Figure 12. Map of study area showing location of well log data and the Wilcox and Vicksburg/Frio growth fault zones.

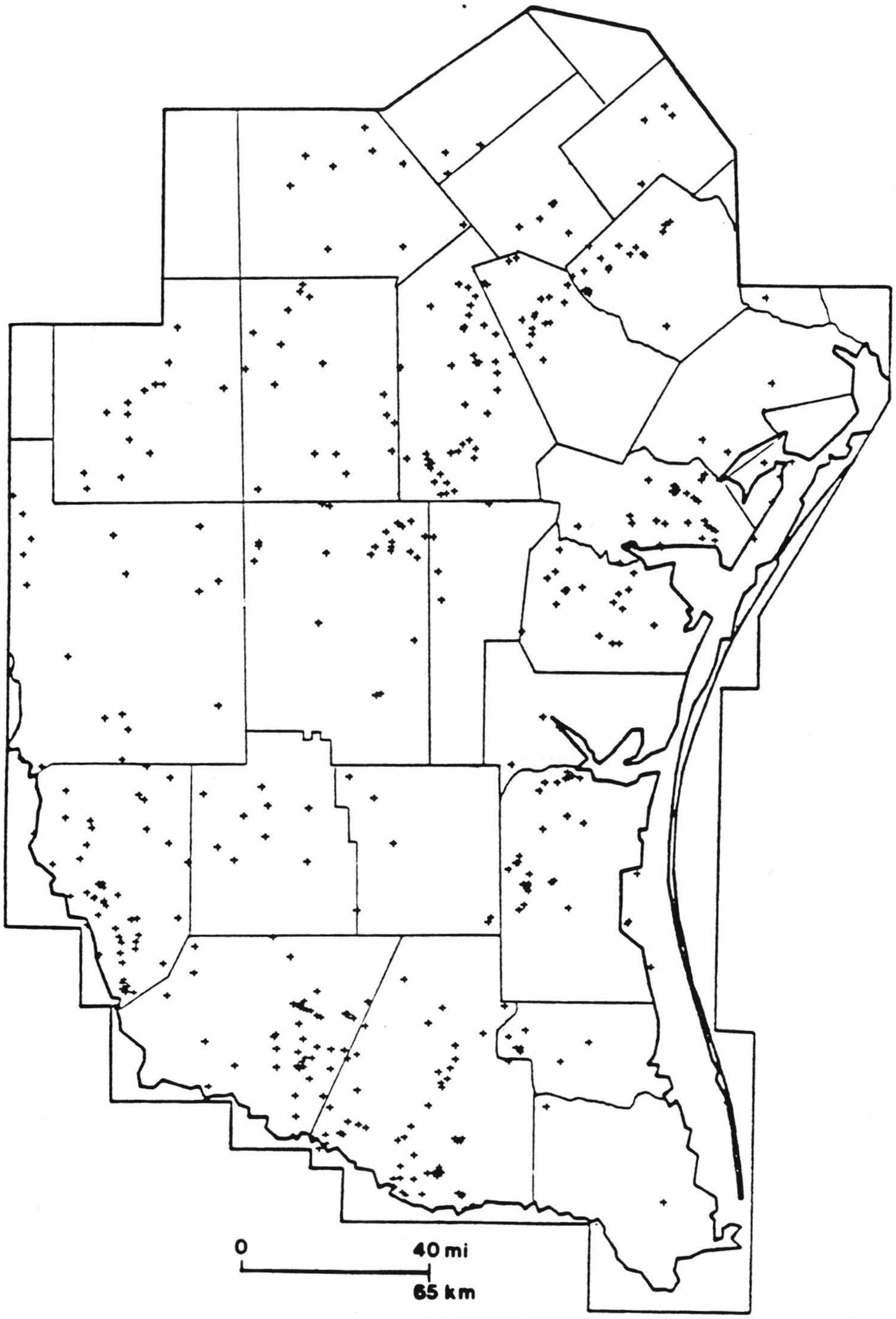


Figure 13a. Well location map for the 150°F isotherm.

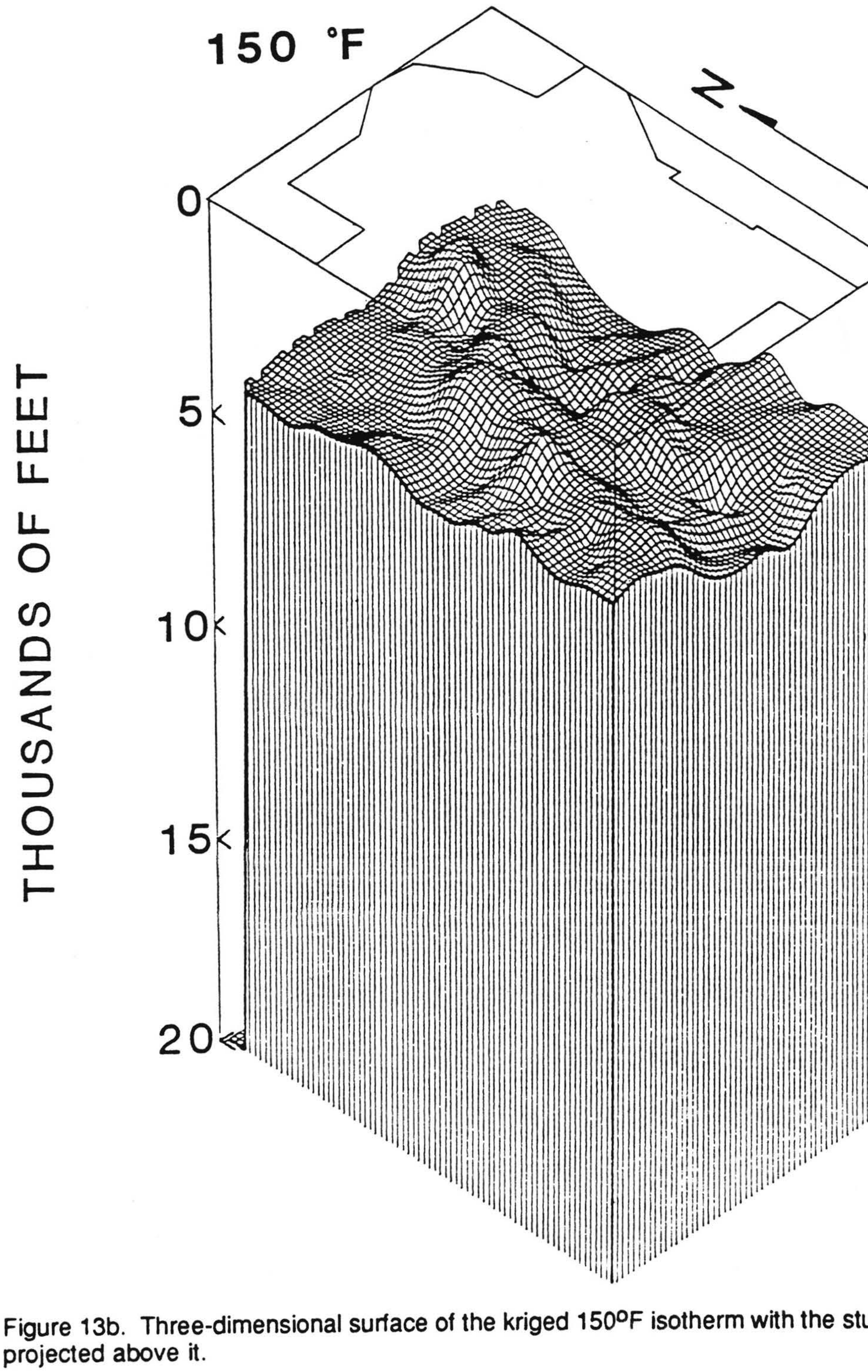


Figure 13b. Three-dimensional surface of the kriged 150°F isotherm with the study area projected above it.

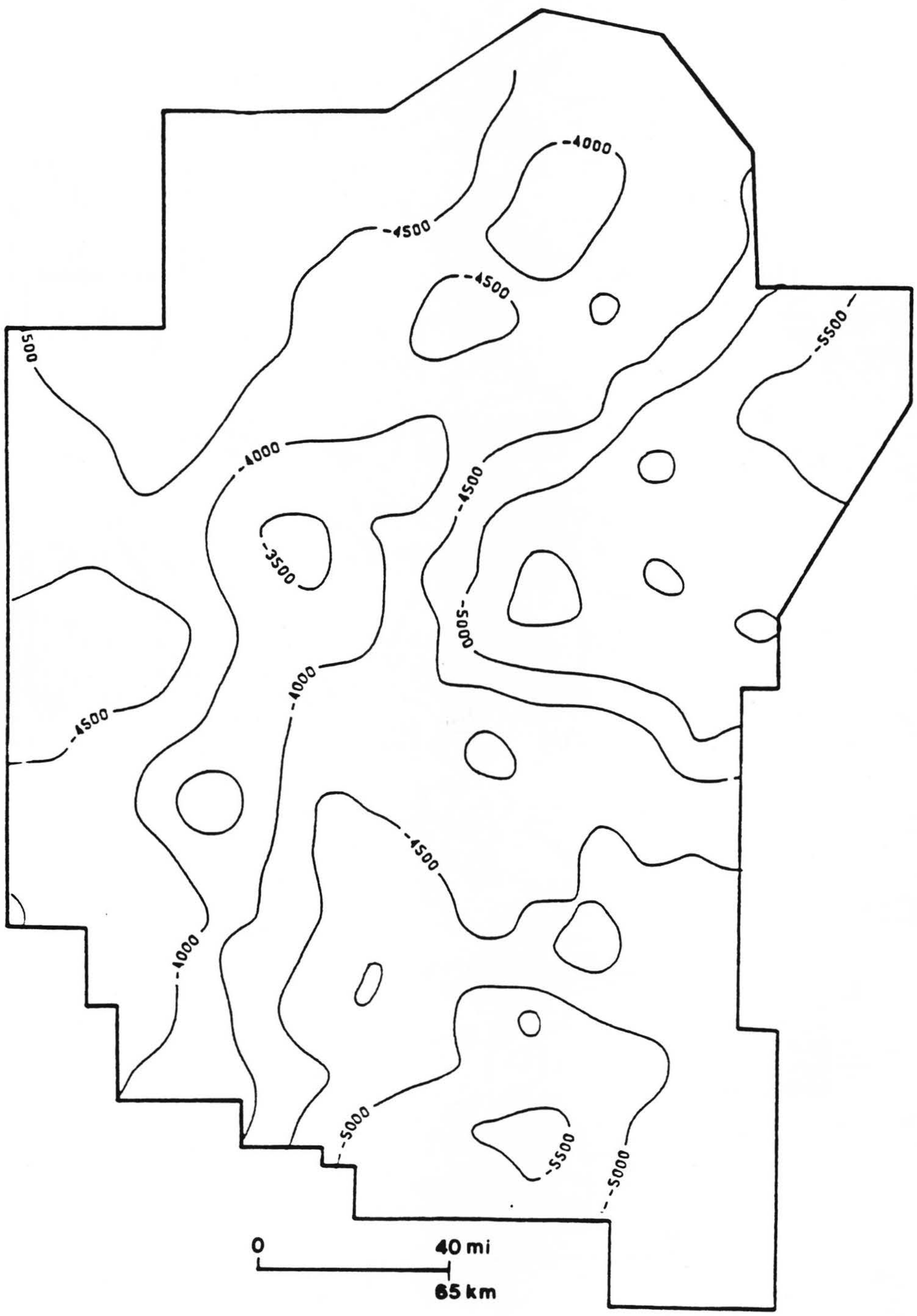


Figure 13c. Contour map (in feet) of the kriged 150°F isotherm.

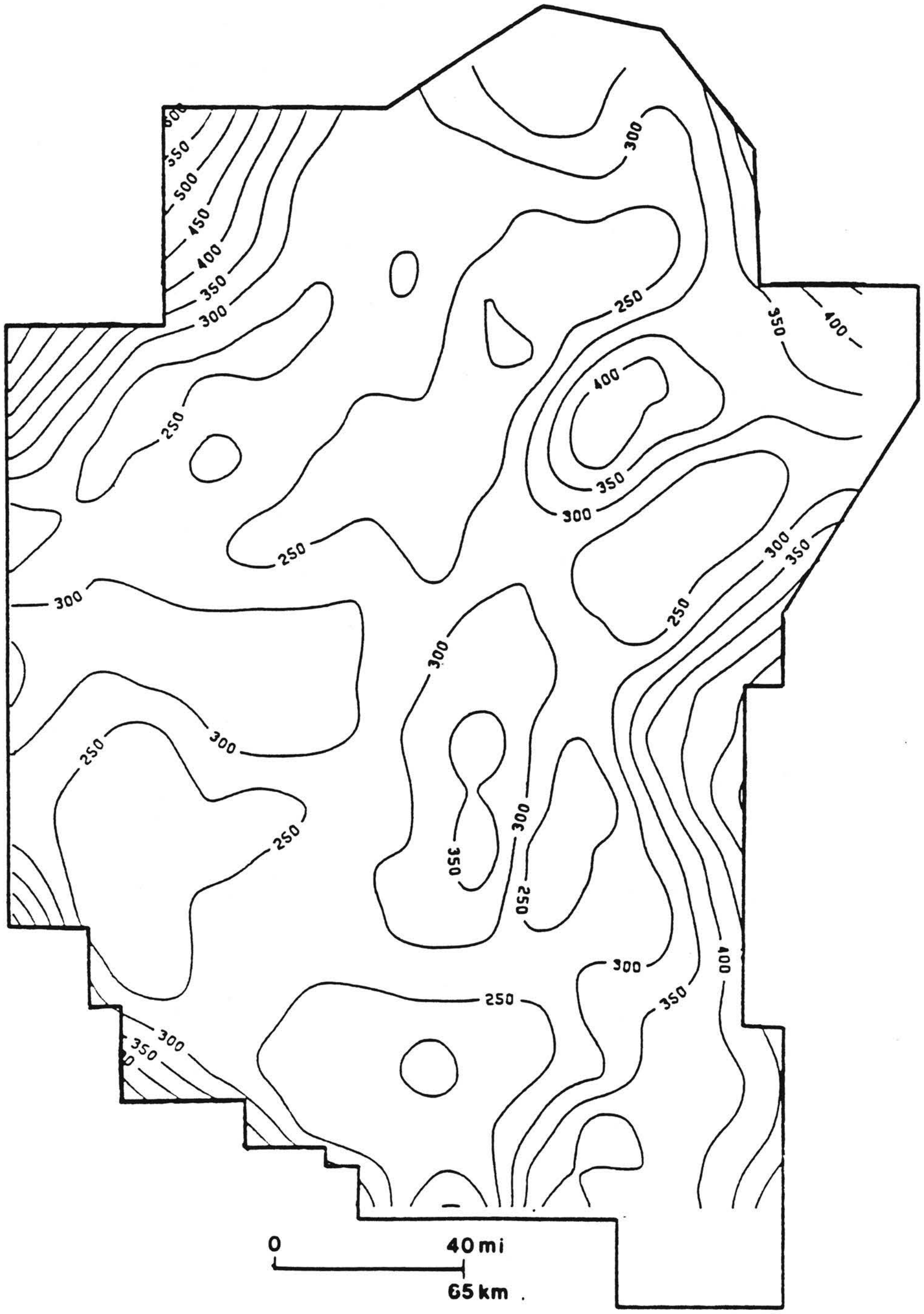


Figure 13d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 150°F isotherm.

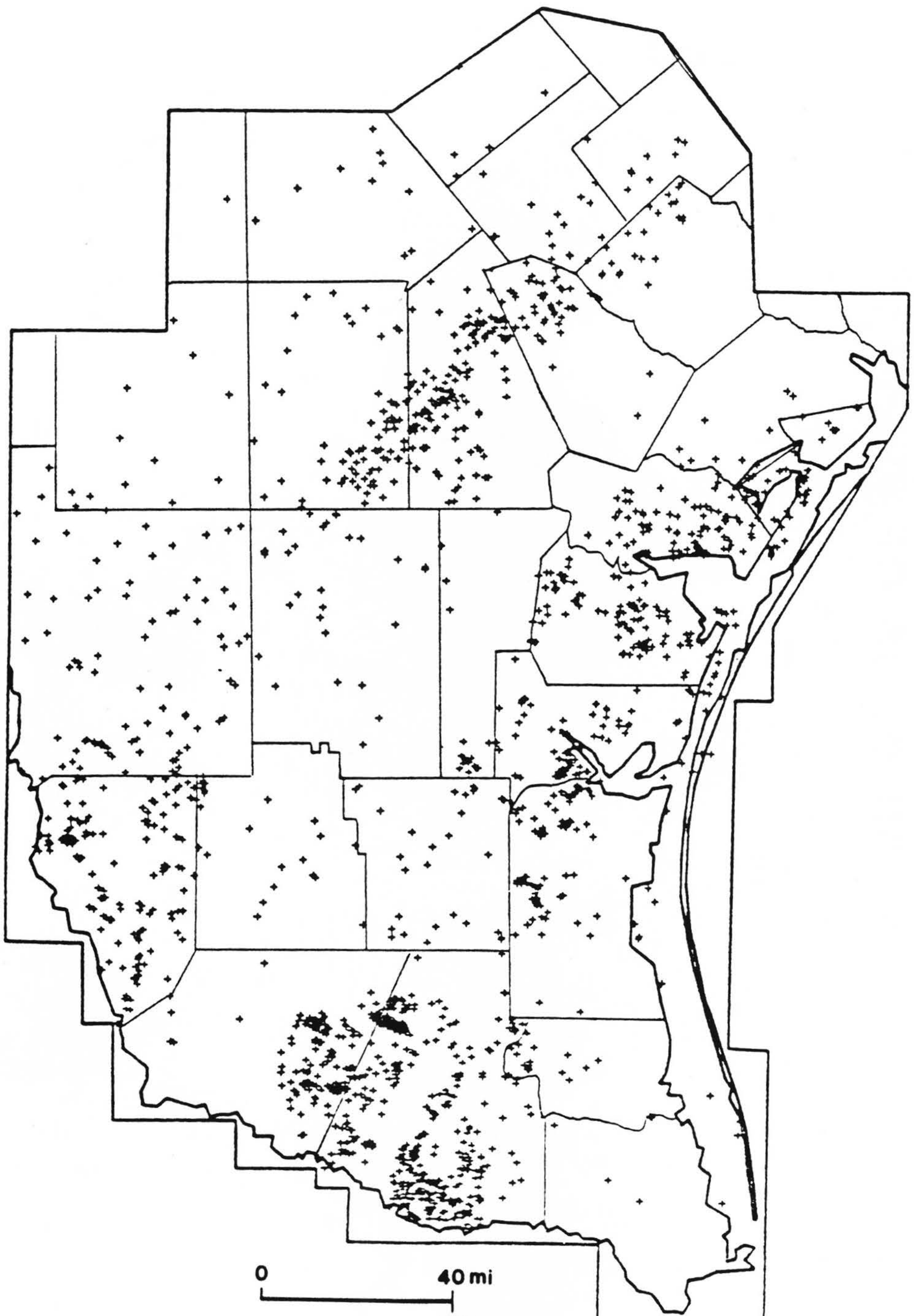


Figure 14a. Well location map for the 200^{o}F isotherm.

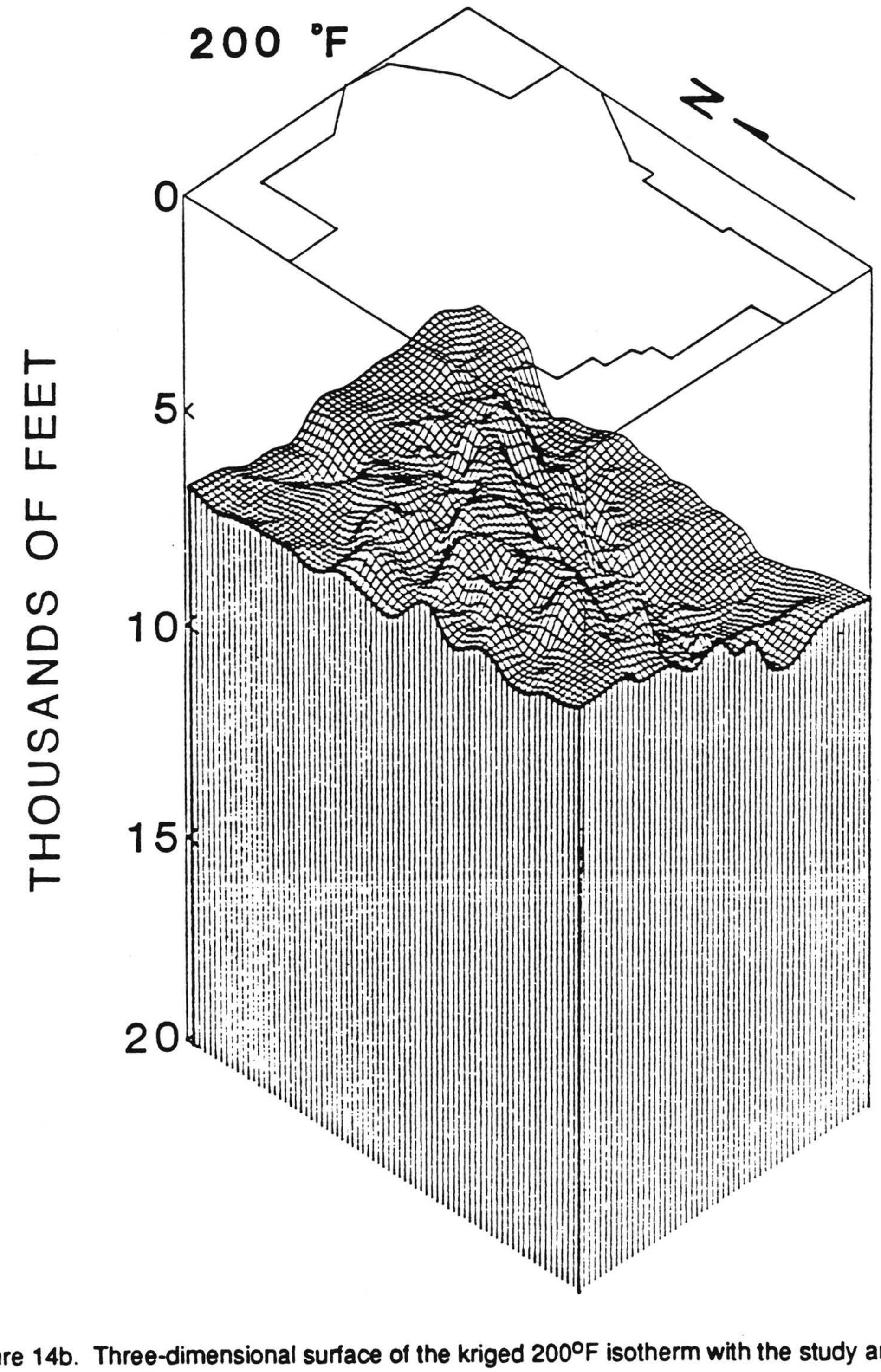


Figure 14b. Three-dimensional surface of the kriged 200°F isotherm with the study area projected above it.

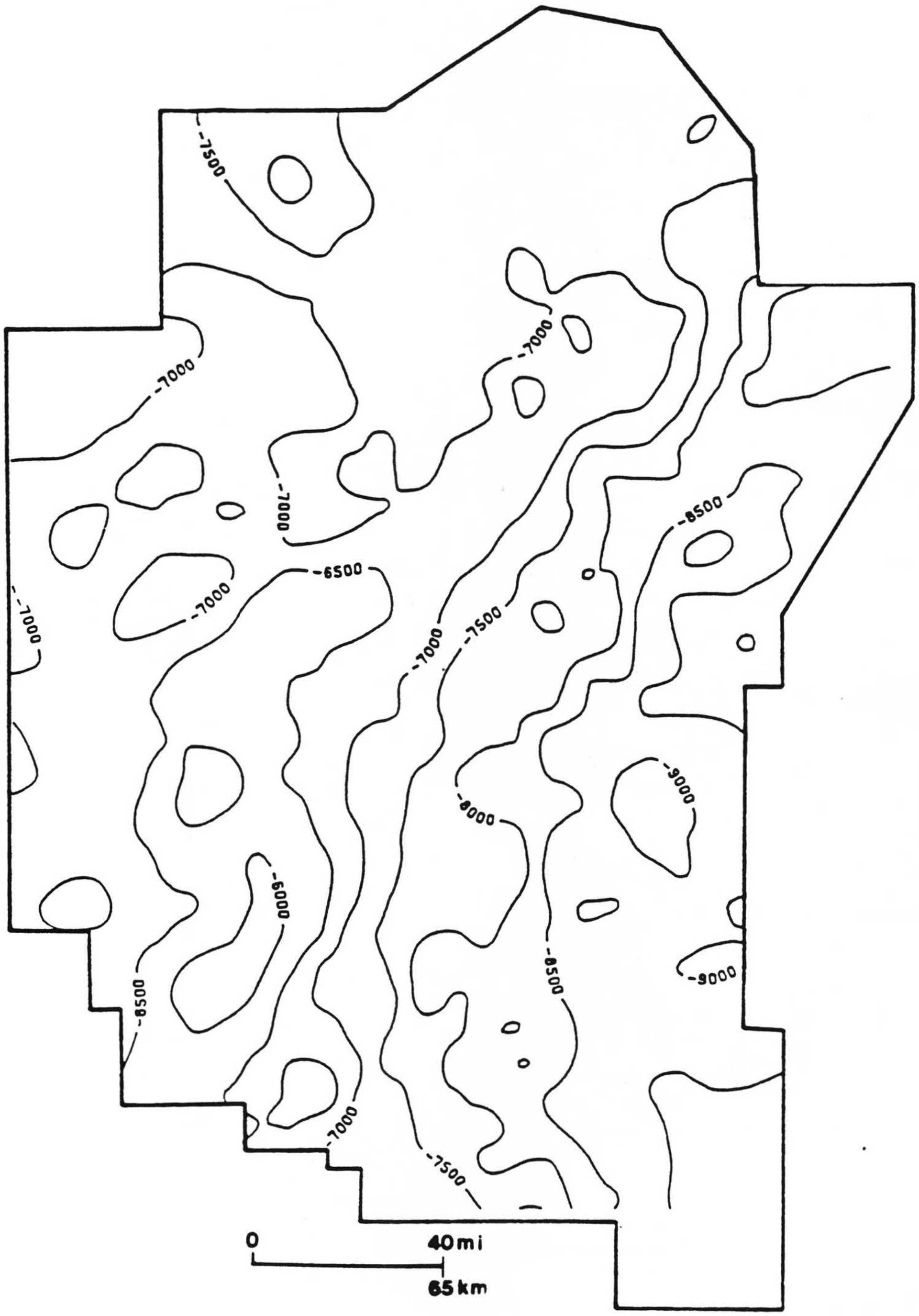


Figure 14c. Contour map (in feet) of the kriged 200°F isotherm.

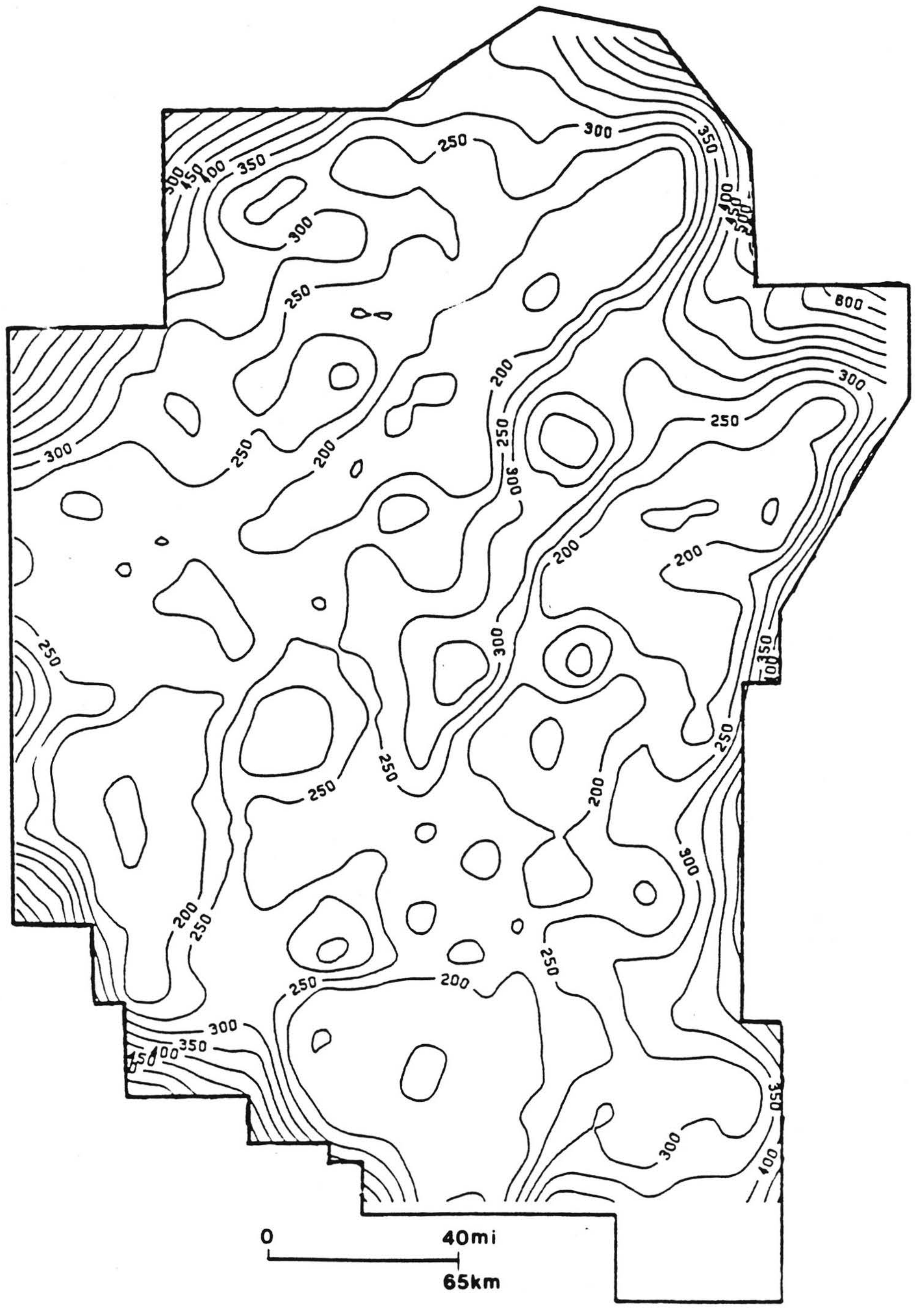


Figure 14d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 200°F isotherm.

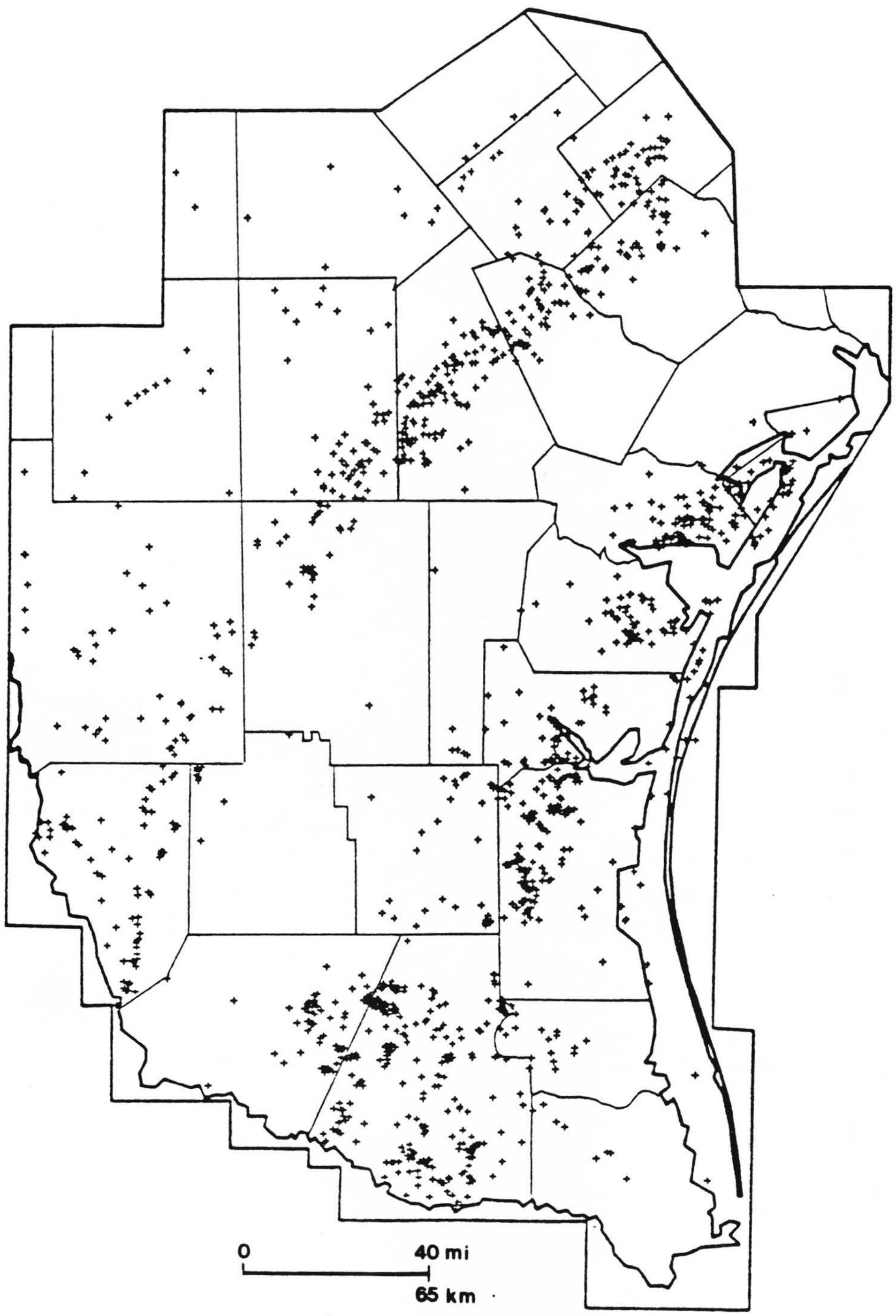


Figure 15a. Well location map for the 250°F isotherm.

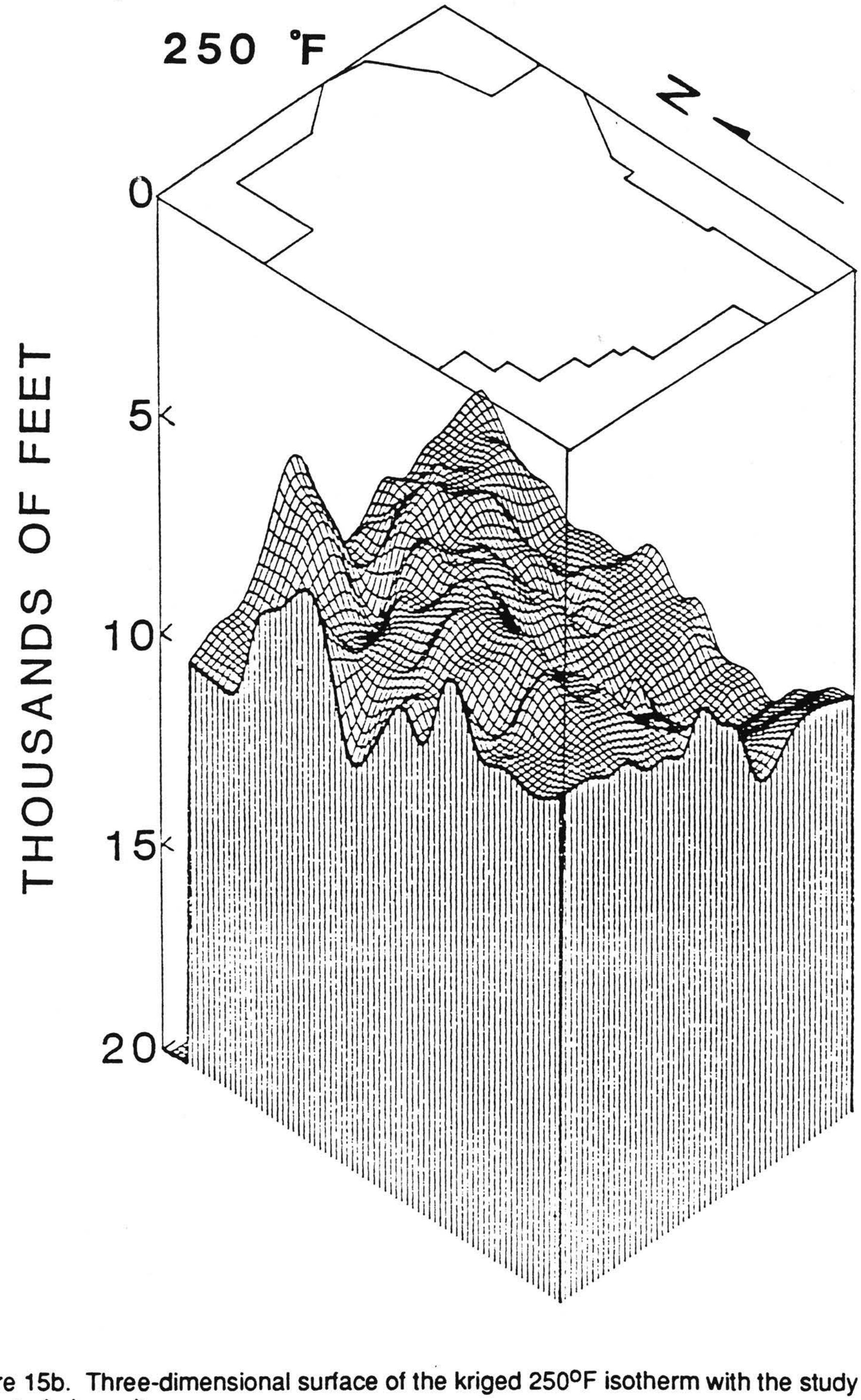


Figure 15b. Three-dimensional surface of the kriged 250°F isotherm with the study area projected above it.

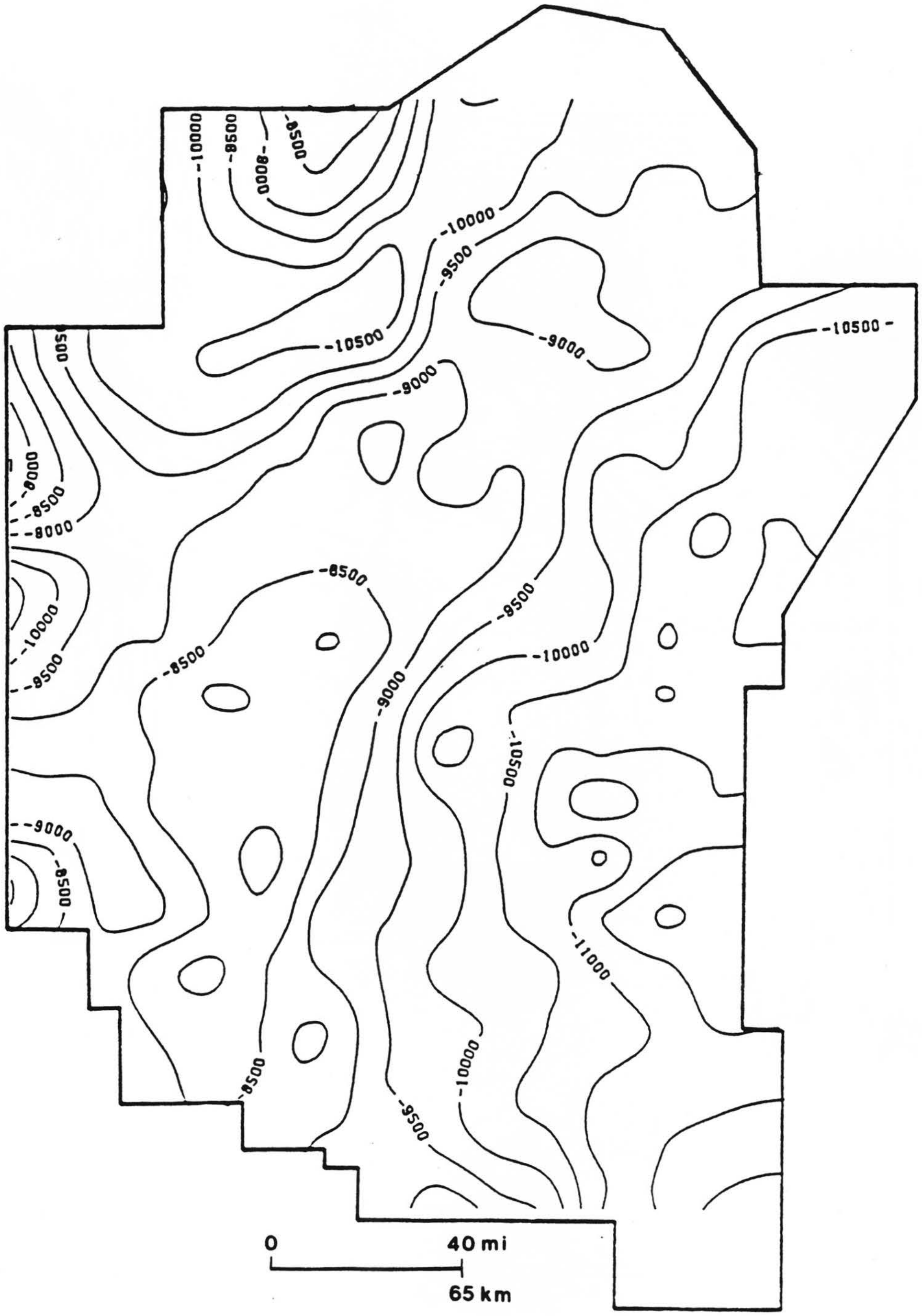


Figure 15c. Contour map (in feet) of the kriged 250°F isotherm.

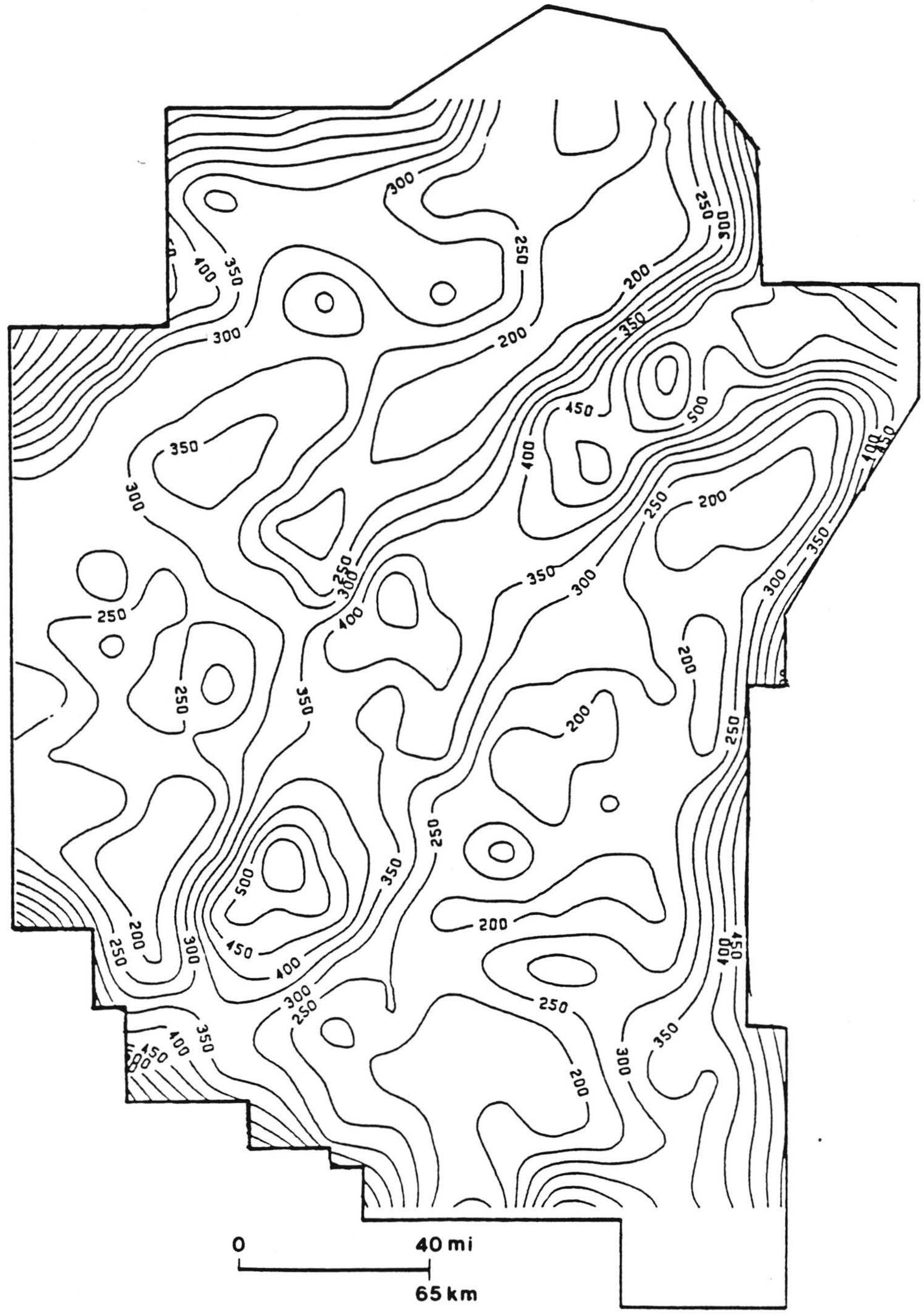


Figure 15d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 250°F isotherm.

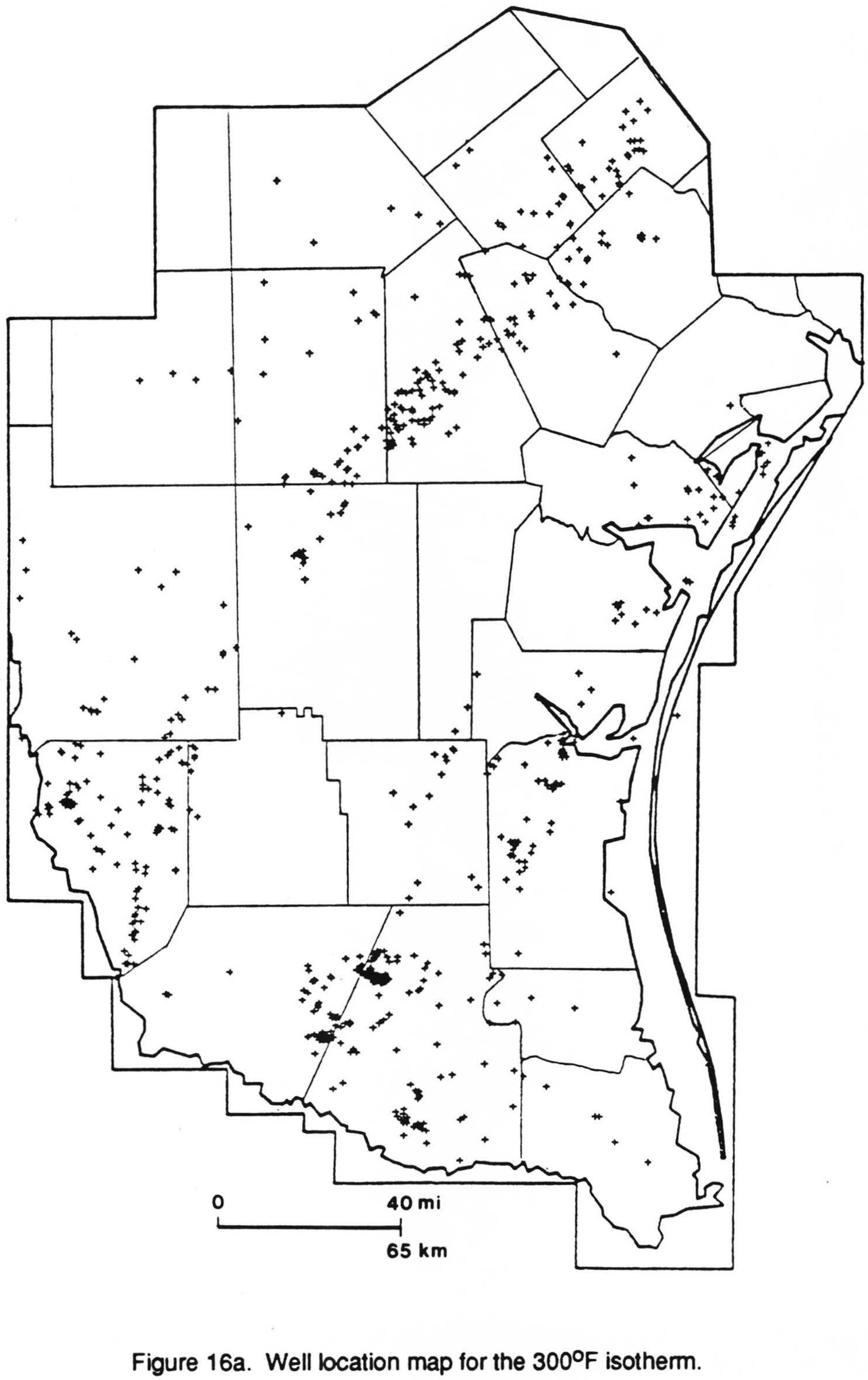


Figure 16a. Well location map for the 300°F isotherm.

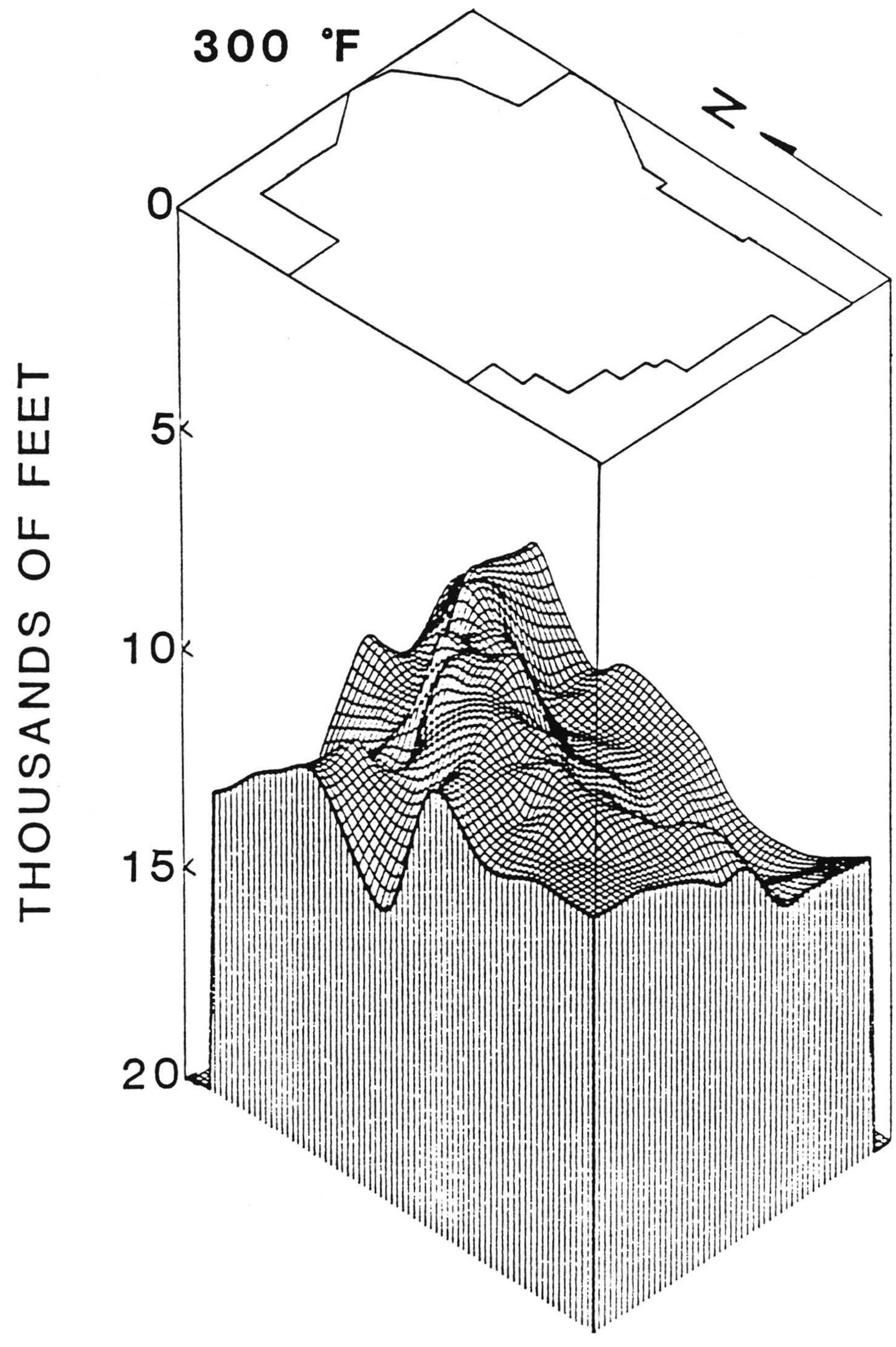


Figure 16b. Three-dimensional surface of the kriged 300°F isotherm with the study area projected above it.

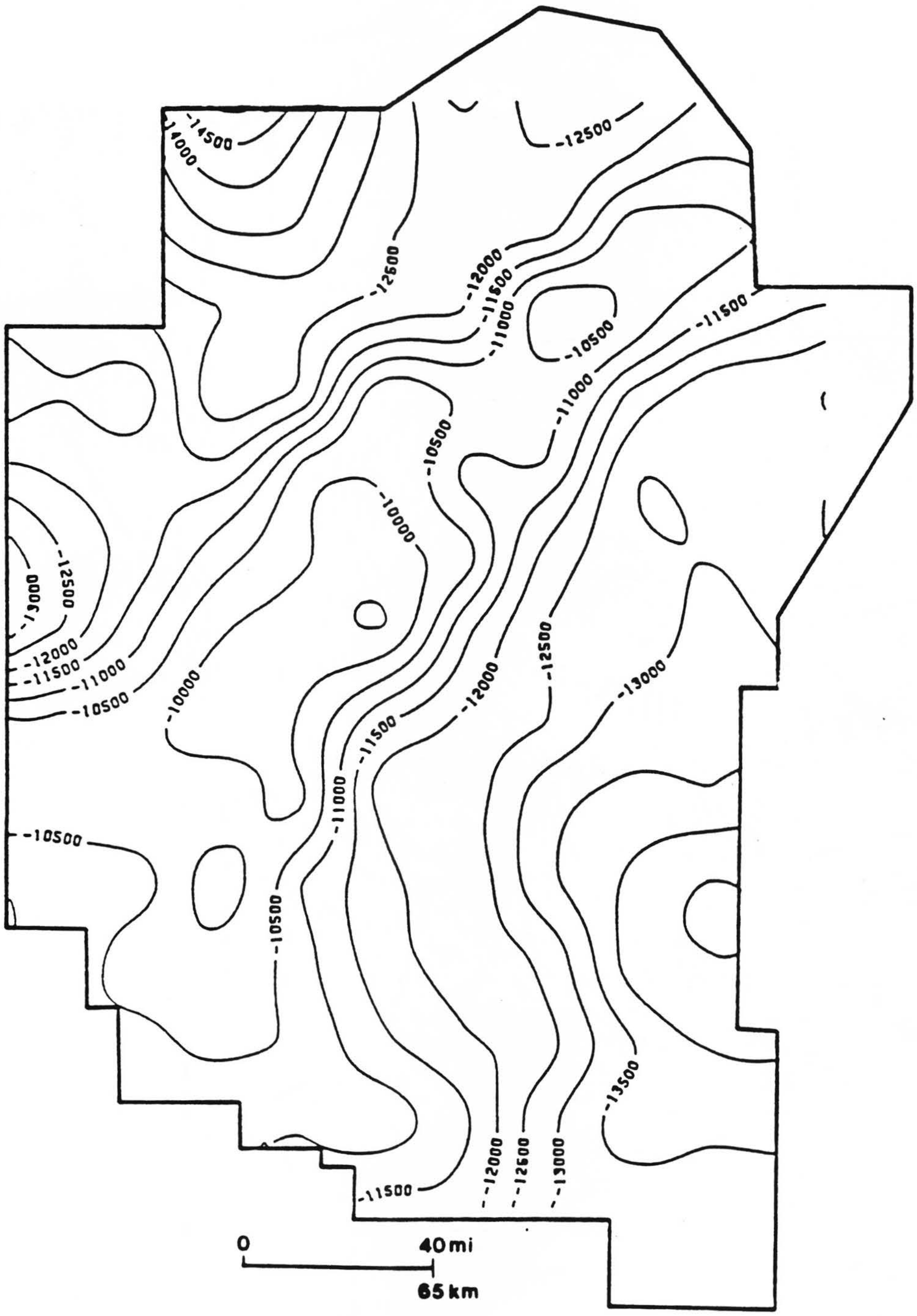


Figure 16c. Contour map (in feet) of the kriged 300°F isotherm.

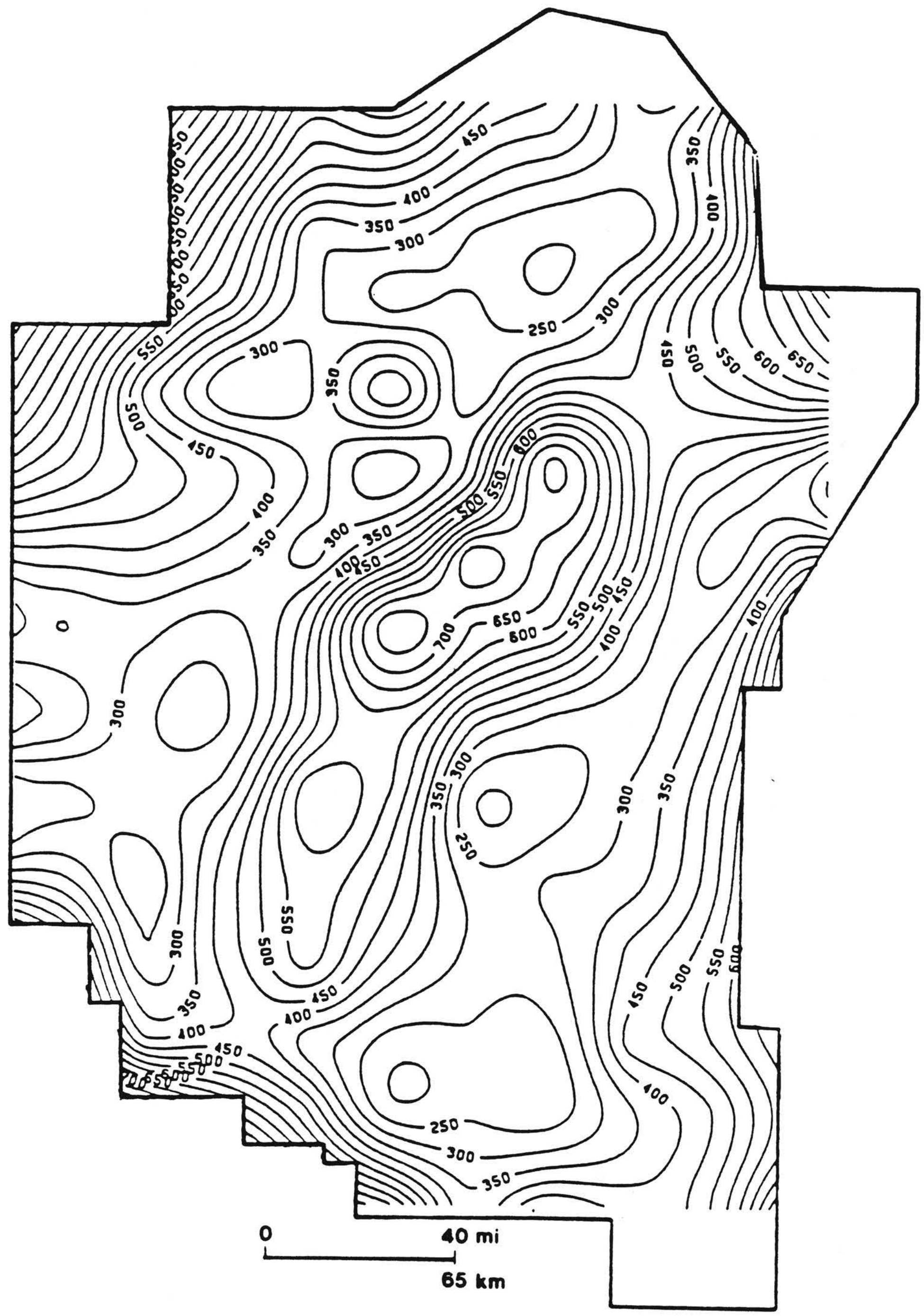


Figure 16d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 300°F isotherm.

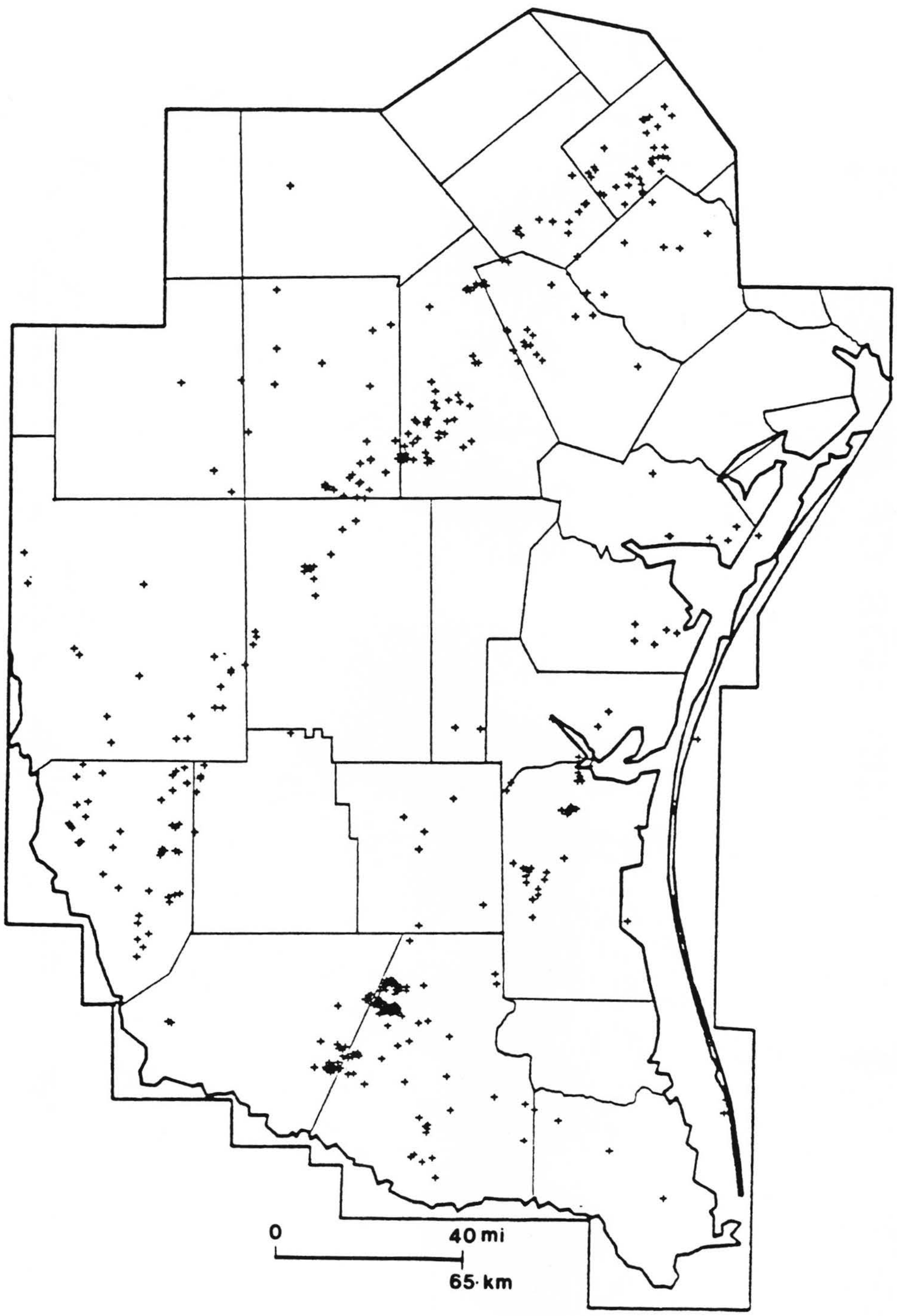


Figure 17a. Well location map for the 350°F isotherm.

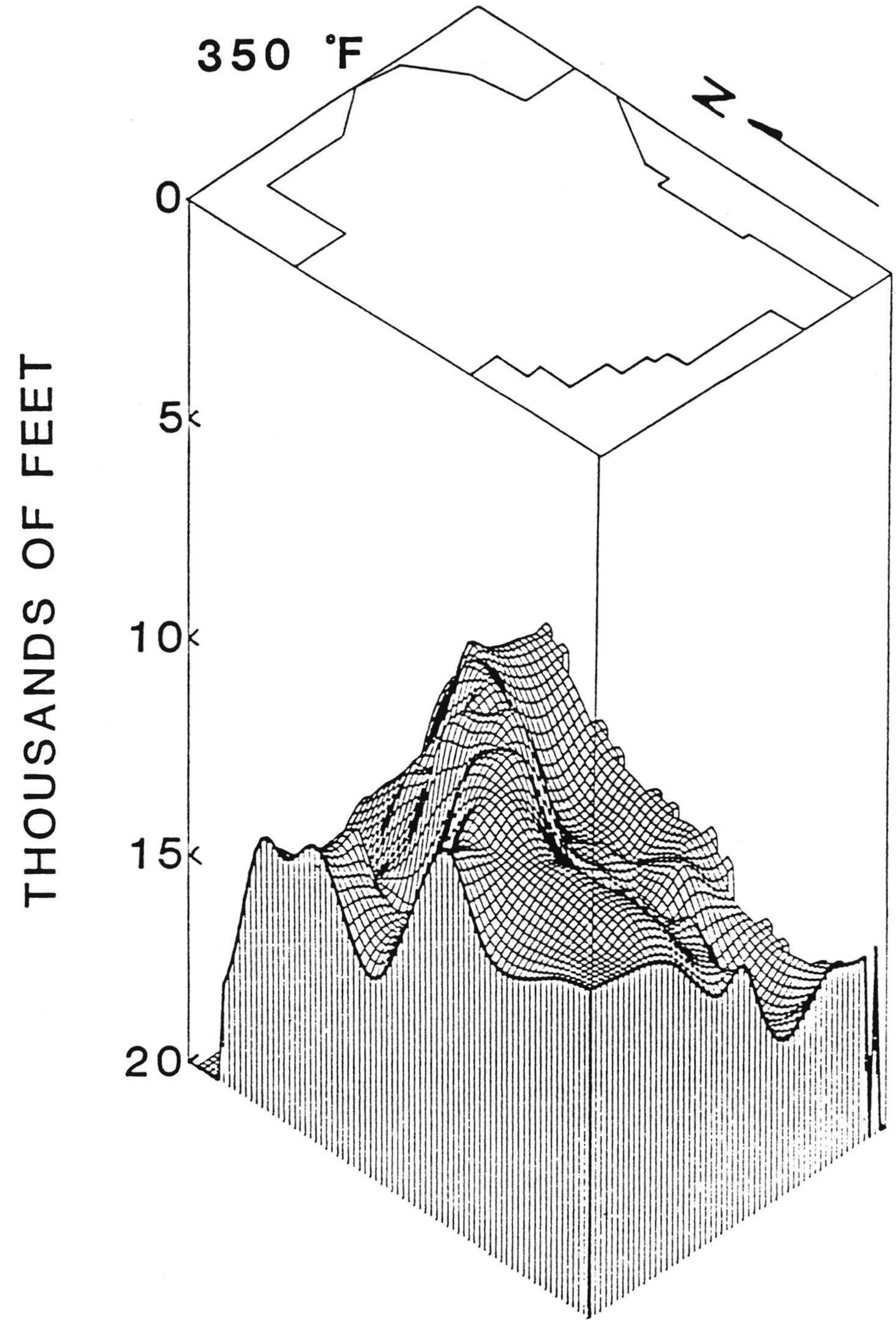


Figure 17b. Three-dimensional surface of the kriged 350°F isotherm with the study area projected above it.

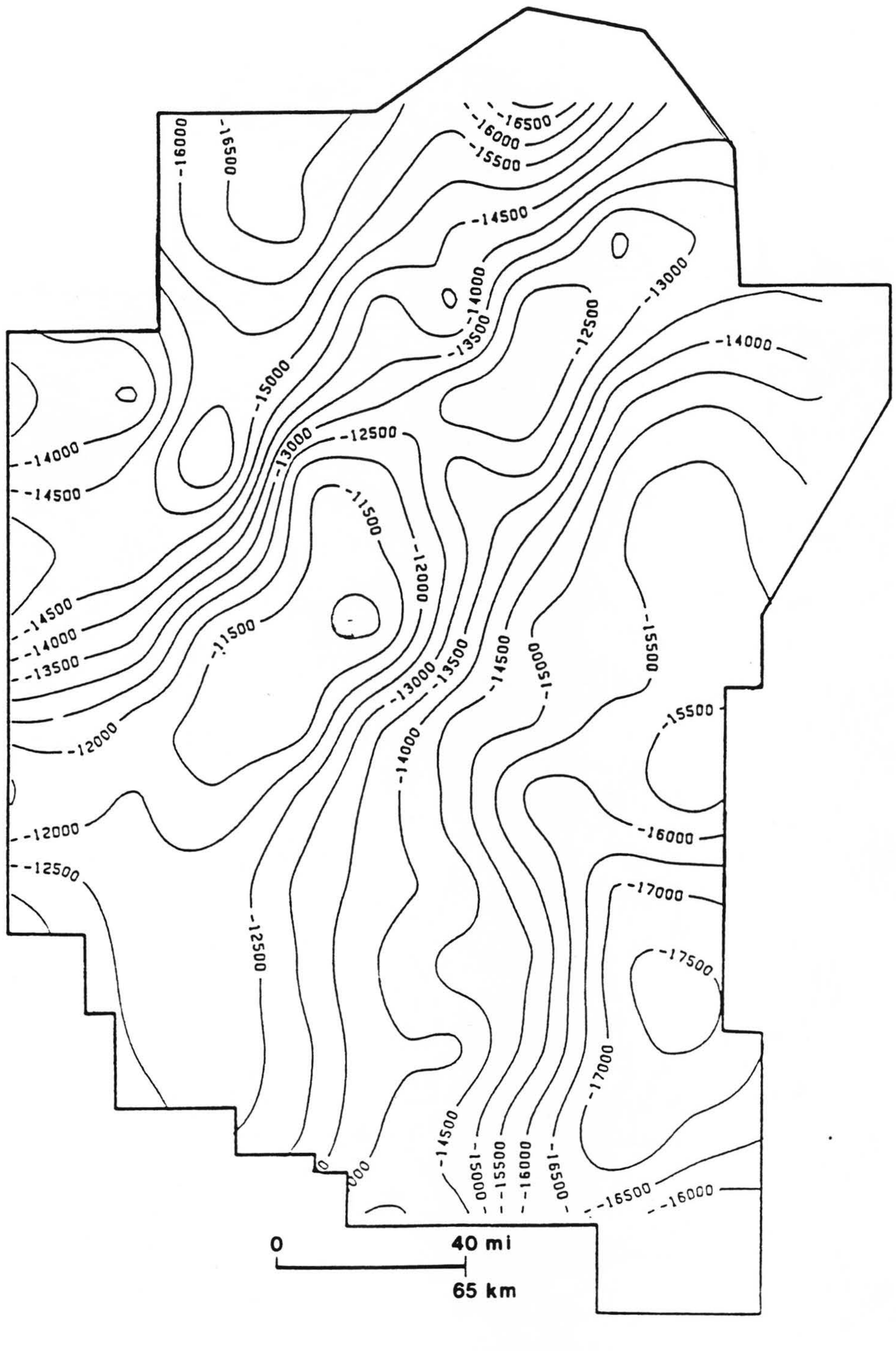


Figure 17c. Contour map (in feet) of the kriged 350^{o}F isotherm.

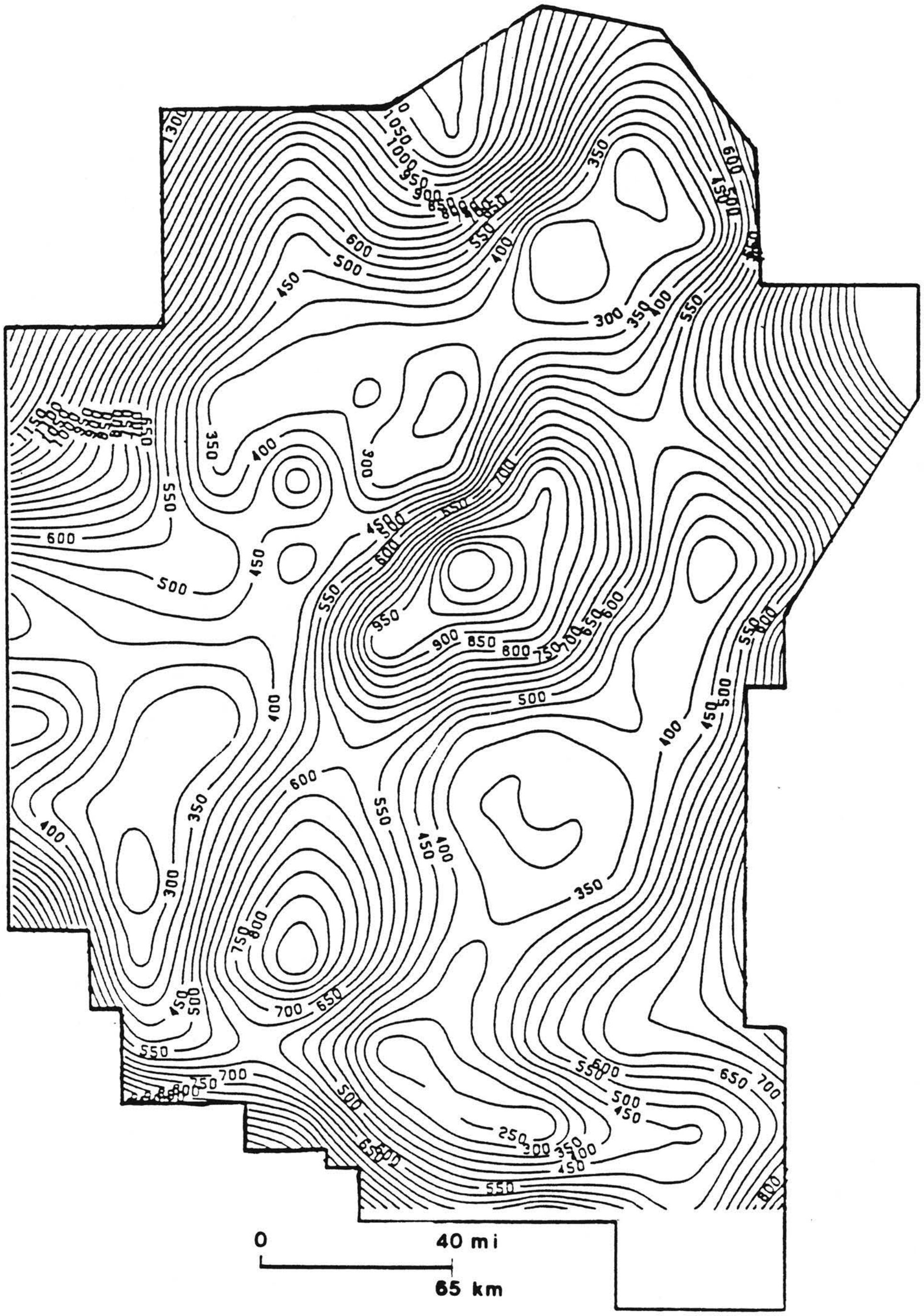


Figure 17d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 350°F isotherm.

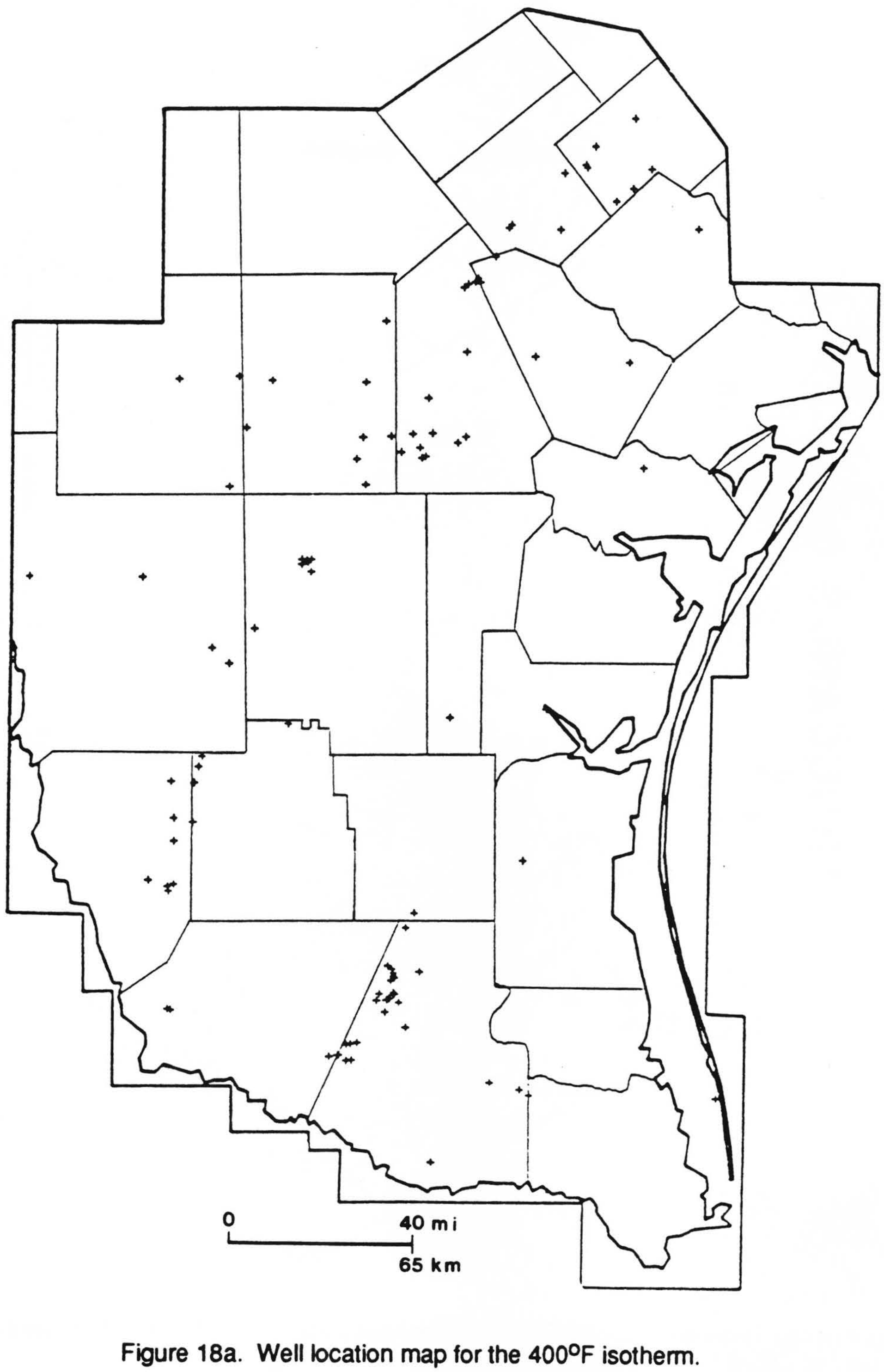


Figure 18a. Well location map for the 400°F isotherm.

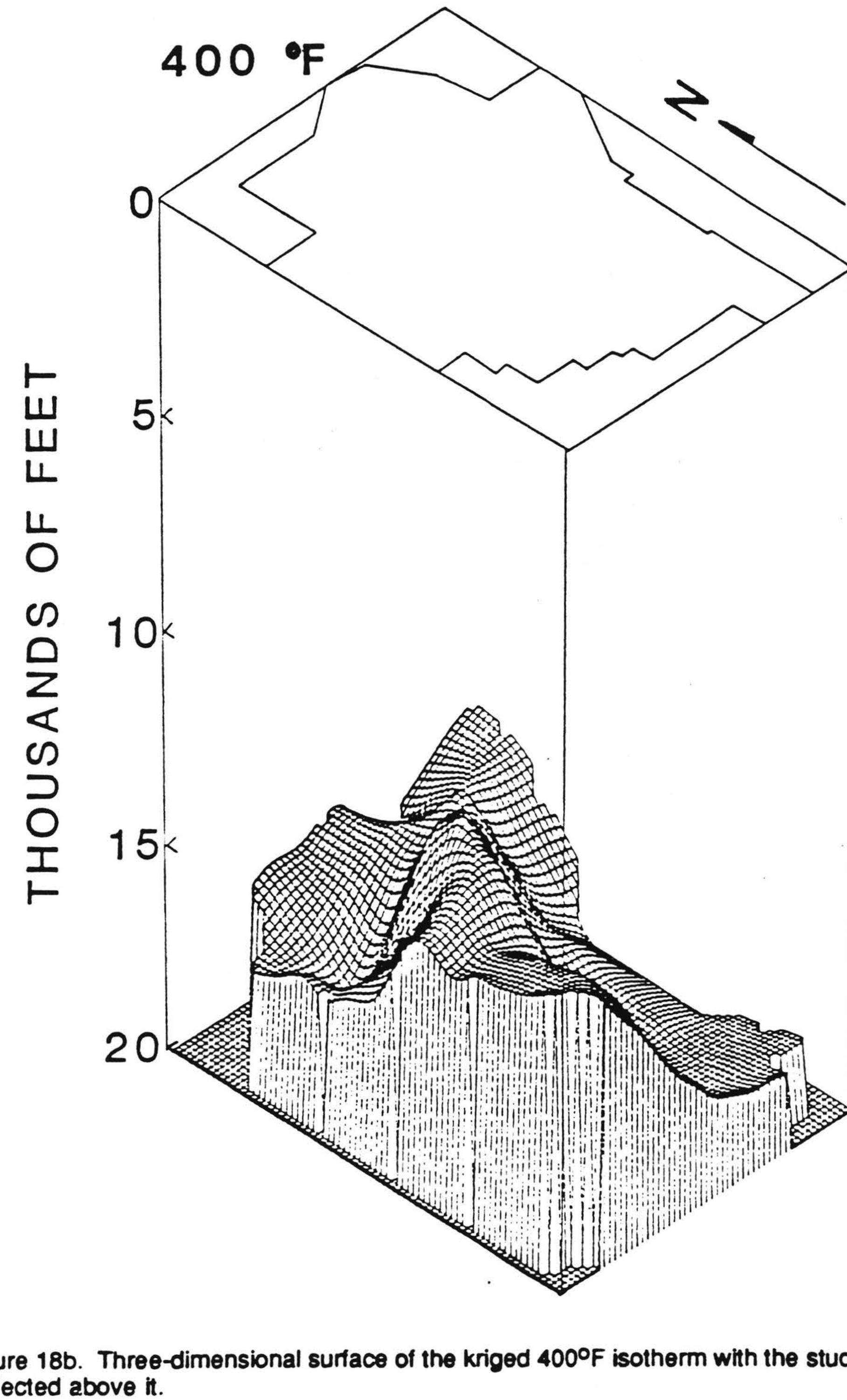


Figure 18b. Three-dimensional surface of the kriged 400°F isotherm with the study area projected above it.

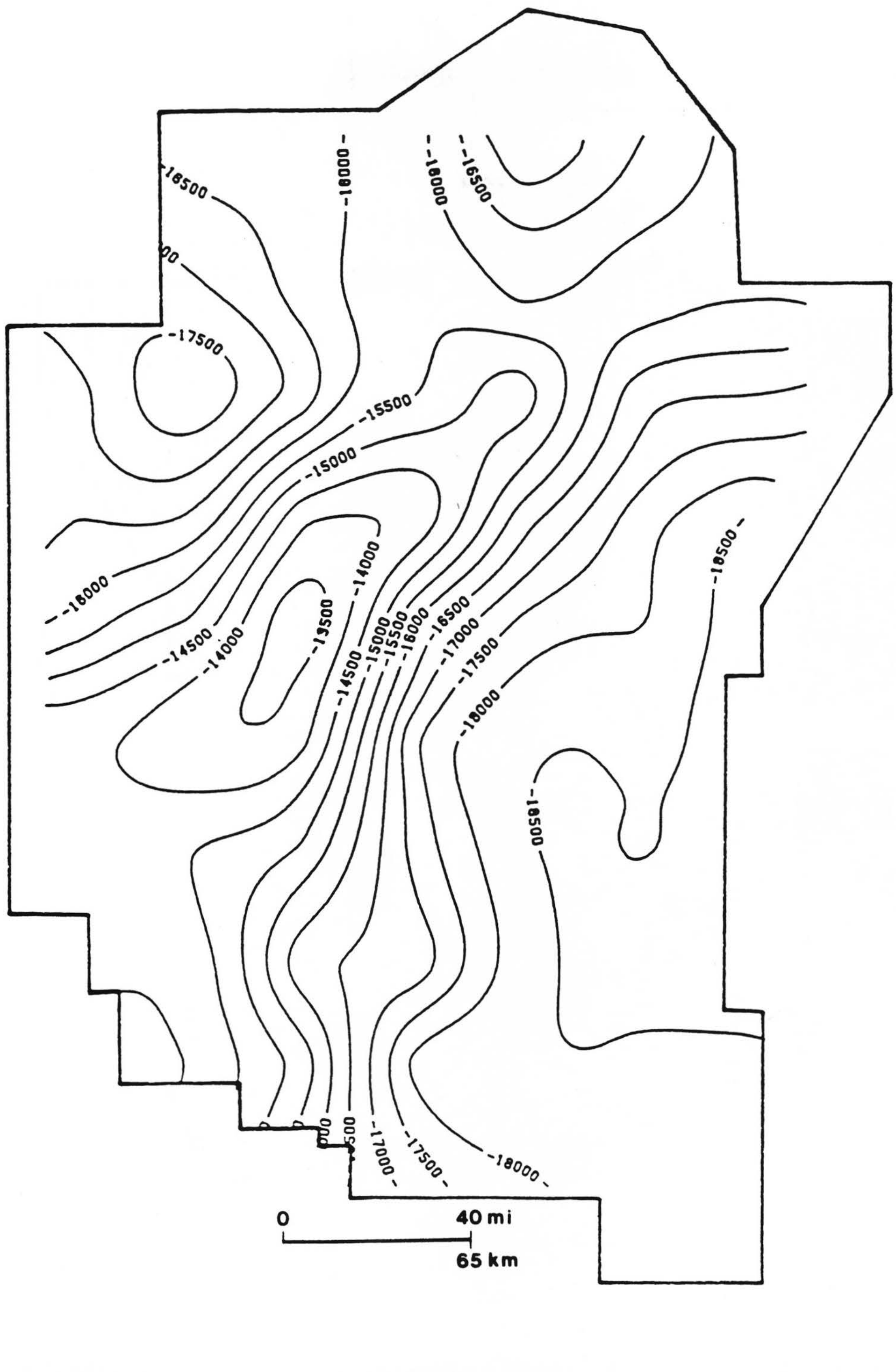


Figure 18c. Contour map (in feet) of the the kriged 400°F isotherm.

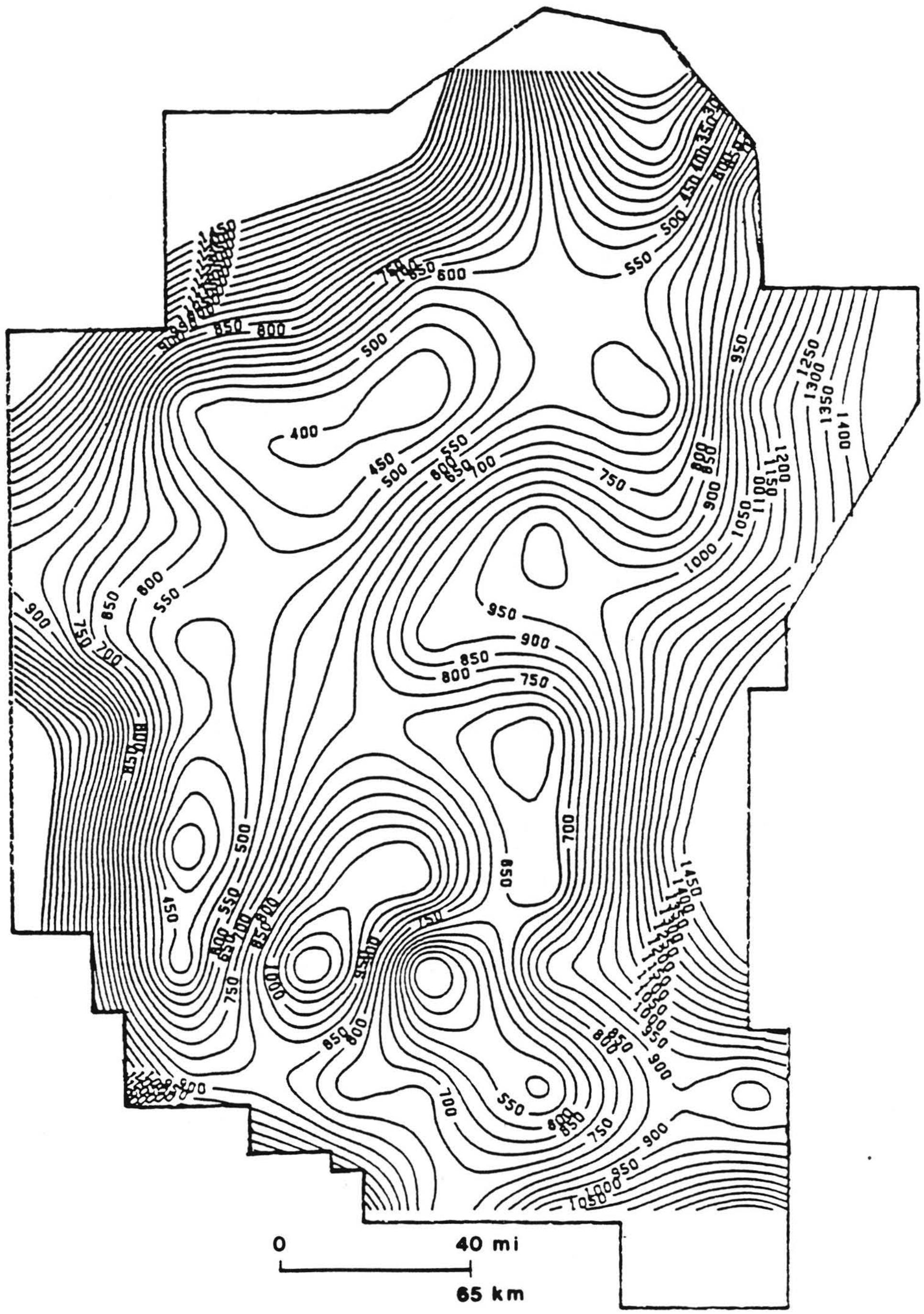


Figure 18d. Contour map (in feet) of the standard deviation as computed by the kriging program for the 400°F isotherm.

likely influenced by surficial conditions such as air temperature. Finally, Figure 11d is a contour map of the standard deviation, which is a measure of data dispersion or uncertainty in the data, as computed by the kriging program. The contours give plus or minus standard deviation in feet. With the 100°F isotherm, the standard deviation is small. However, the deviation increases toward the edges of the study area where data are much more scarce (Fig. 11a) and the uncertainty is greater.

The 150°F isothermal surface (Figs. 13a-13d), which was created from 446 data points, possesses a perturbation which coincides with and is just coastward of the Wilcox growth fault zone. The perturbation, a ridge in the isothermal surface, becomes apparent at approximately 3500 to 4500 feet (1070 to 1370 m) (compare Figure 12 with Figures 13b and 13c). This is important in that these depths are well above the top of the geopressured, compactional regime in the Wilcox growth fault zone (see Figure 26). Thus the perturbation suggests that advecting fluids are moving up along the growth faults out of the geopressured, compactional regime and perturbing the temperature field in the overlying meteoric regime. In addition, the contour map of the 150°F isotherm (Fig. 13c) indicates that cooler areas are present both updip of the perturbation and to the east and south-southeast within the study area. Finally, the standard deviation map for the 150°F isotherm (Fig. 13d) shows small deviations that increase at the edges of the study area.

At 200°F (Figs.14a-14d), 1,646 data points were used to construct the isothermal surface. However, the overall surface at 200°F is somewhat subdued compared to the 150°F isotherm. Nevertheless, a perturbation continues to be present along and just coastward of the Wilcox growth fault zone. However, no perturbation is present in the area of the Vicksburg/Frio growth fault zones. In fact, as with the 100°F and 150°F isotherms, the deepest depths at which the 200°F isotherm occurs are present in the Vicksburg/Frio growth fault zones. Figure 14d indicates that the standard deviation as computed by the kriging program for the 200°F isotherm continues to be relatively small. However, the edges of the study area show a higher degree of uncertainty in the data for the 200°F isotherm than for the 100°F and 150°F isotherms, possibly because of the concentration of data along the growth fault zones for the 200°F isotherm (Fig. 14a).

As with the 200°F isothermal surface, a large number of data points (1,277) were used to construct the 250°F surface (Figs. 15a-15d). However, the ridge or perturbation in the surface along and just coastward of the Wilcox growth fault zone is more prominent in the 250°F than in the 200°F isothermal surface. Although an anomalously shallow area at which the isotherm occurs is present updip of the Wilcox fault zone (Figs. 15b and 15c), study of the well locations in that area (Fig. 15a) indicates that the anomaly is caused by one or two data points and probably does not reflect a trend. The 250°F isothermal surface does not show any evidence of a perturbation in the area of the Vicksburg/Frio growth fault zones, and in fact, deeper depths at which the 250°F isotherm occurs are present in the southeastern part of this fault zone. With respect to standard deviations, Figure 15d indicates an increase in the uncertainty of the data compared to the 100°F, 150°F, and 200°F isothermal surfaces.

The 300°F isothermal surface (Figs. 16a-16d), which was created from 644 data points, shows that the perturbation along and just coastward of the Wilcox growth fault zone is continuing to become more prominent with increasing temperature and thus with increasing depth (Figs. 16b and 16c). In addition, as with the other isotherms, a cooler area is present both updip of the Wilcox growth fault zone and in the southeast section of the study area in a section of the Vicksburg/Frio growth fault zones. No evidence of a perturbation along the Vicksburg/Frio growth fault zone exists within the 300°F isothermal surface. However, Figure 16d indicates that with increasing temperature and thus increasing depth, the standard deviations are becoming greater as a result of fewer data points, a concentration of data along the growth fault zones, and increasing depth differences among the data points.

The 350°F isothermal surface which was created from 437 data points is much like the 300°F in that there is a continued prominence with depth of the thermal anomaly along the Wilcox growth fault zone (Figs. 17b and 17c). In addition, the deepest depths at which the isotherm occurs are located both updip of the Wilcox growth fault zone and in the southeastern section of the Vicksburg/Frio growth fault zones. However,

Figure 17d shows that the standard deviations are much higher for the 350°F isothermal surface than for the 300°F isothermal surface.

The 400°F isothermal surface (Figs. 18a-18d) was created from much fewer data points (104) than the other isothermal surfaces. Nevertheless, the thermal anomaly along the Wilcox growth fault zone is very prominent (Figs. 18b and 18c), but the standard deviation map shows a great deal of uncertainty in the data (Fig. 18d).

A dip-oriented, cross-sectional view of the seven isotherms with their corresponding standard deviations (Figs. 19 and 20) indicates that the thermal anomaly present along the Wilcox growth fault zone becomes more prominent with depth. In addition, the cross section indicates that the standard deviation becomes greater with depth as the data become more uncertain. According to Gretener (1981), rock types with high thermal conductivities become less conductive with increasing temperature. Thus, large conductivity contrasts between different rock types are a shallow phenomenon of roughly the top 6500 feet (2000 m) of sediment (Gretener, 1981). Clearly, simple thermal conductivity contrasts can not explain the increased prominence with depth of the thermal anomaly along the Wilcox growth fault zone. In addition to the thermal conductivity of rock types, the thermal conductivities of organic liquids (e.g., hydrocarbons) and water must also be taken into account. The thermal conductivity of water is several times larger than that of pure hydrocarbons and exhibits a maximum at about 260°F (125°C) before decreasing with higher temperatures (Prats, 1982). The thermal

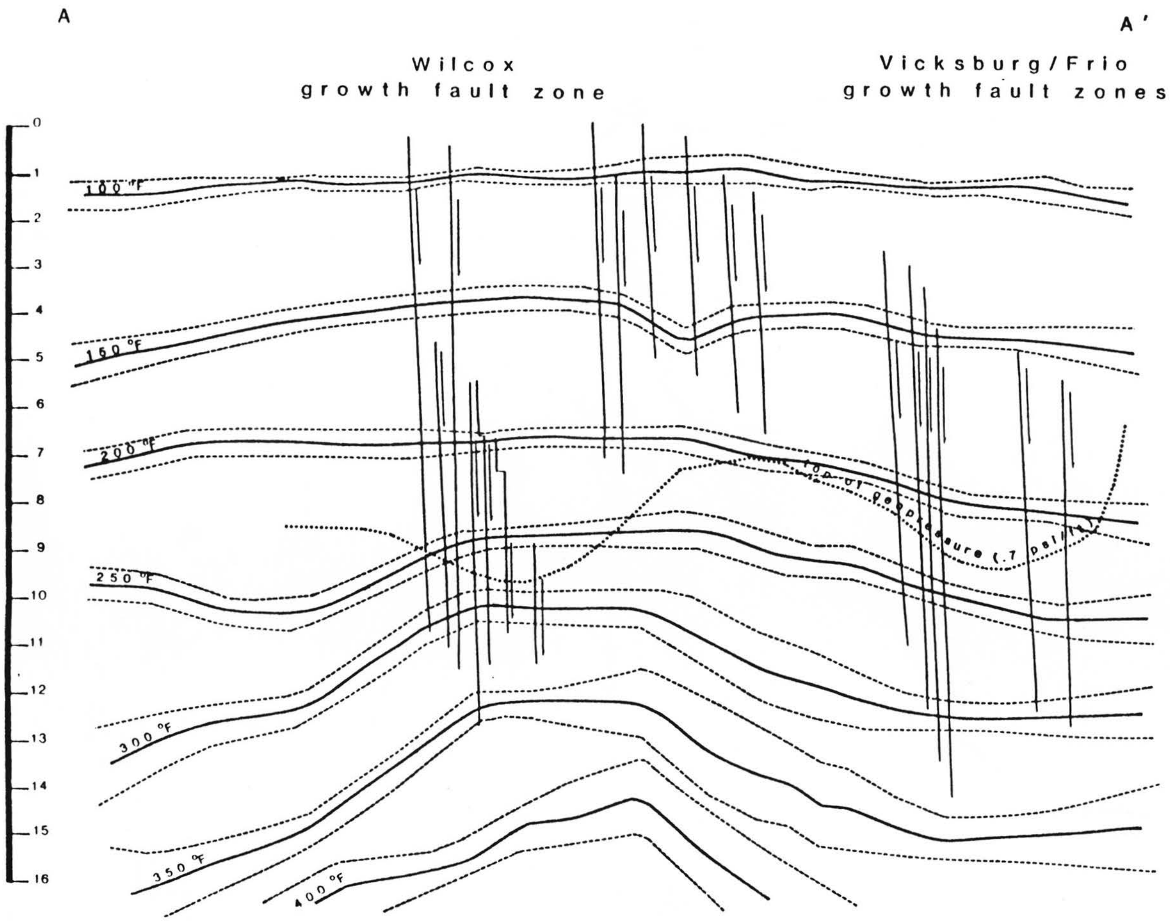


Figure 19. Cross-sectional view of isothermal surfaces with standard deviations (dashed lines), top of geopressure (>0.7 psi/ft), and growth faults. Location of cross section is shown in Figure 20.

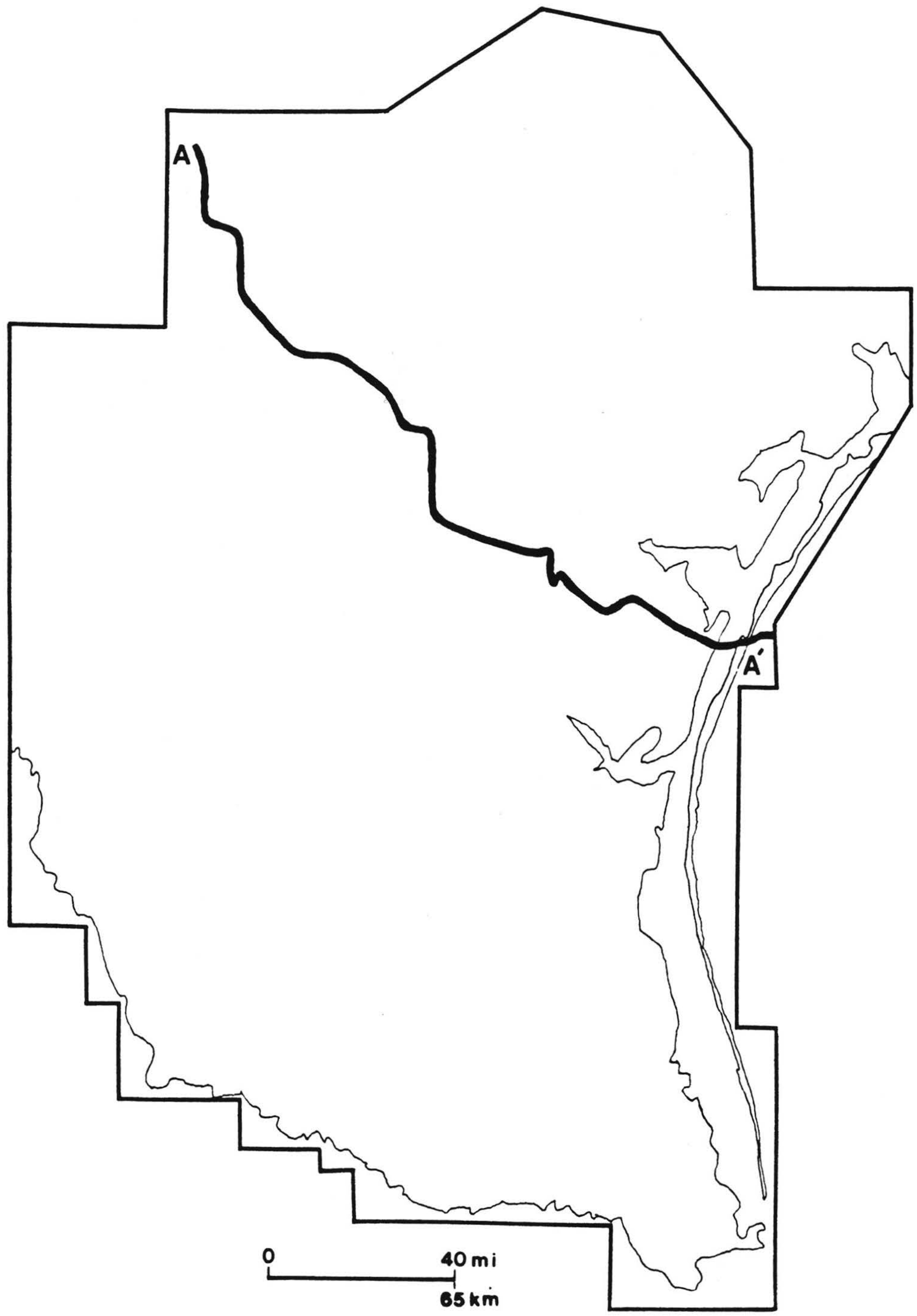


Figure 20. Location of cross section shown in Figure 19.

conductivities of saturated organic liquids decrease with increasing temperature and are not very sensitive to changes in pressure (Prats, 1982). Thus, at first glance, it seems reasonable that large hydrocarbon reservoirs at depth along the Wilcox growth fault zone might help to create a thermal anomaly. However, no major thermal anomaly is present at depth along the Vicksburg/Frio growth fault zones; an area that has been extensively drilled for oil and gas.

Temperature Gradients

Thermal variations can also be observed by calculating temperature gradients of a number of subregions within the study area. The temperature gradient is taken from the inverse of the slope of the regression line drawn through the data on a temperature versus depth plot (Fig. 21 is an example). For this purpose the study area was divided into 63, 625 square mile (1,620 square km) sections using the grid shown in Figure 22. Once this was done, the Wilcox and Vicksburg/Frio growth fault zones were sketched onto a map of the partitioned study area in order to determine where the fault zones lie in the given subregions (Fig. 23). If a fault zone only fell within part of a subregion, two plots were made; one with data within the fault zone and one with data outside of the fault zone. Otherwise, for a subregion that lay entirely within or outside of a growth fault zone, only one plot was made.

The first step in analyzing the temperature gradients within the study area involved taking the overall geothermal gradient of each plot

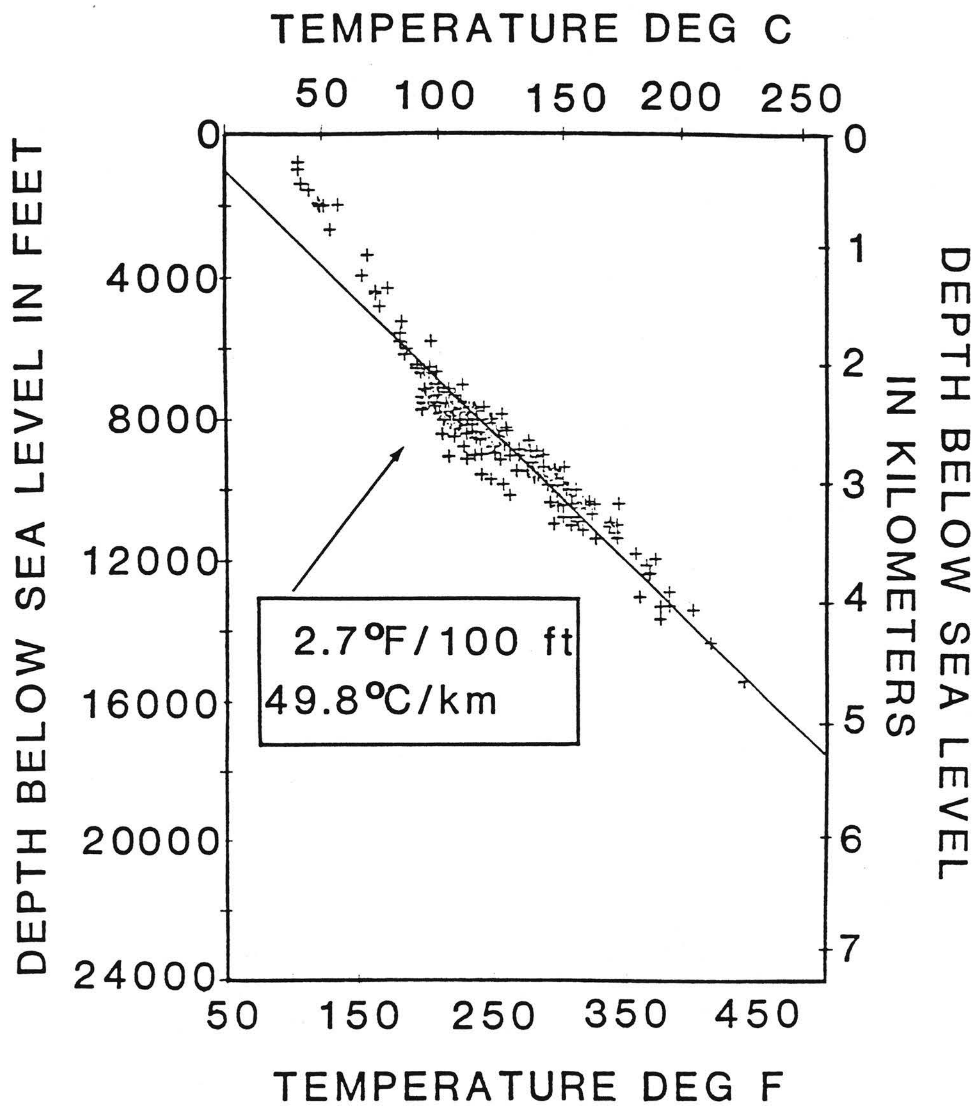


Figure 21. Temperature versus depth plot of a typical subregion along the Wilcox growth fault zone. Location of data is shown in Figure 22.

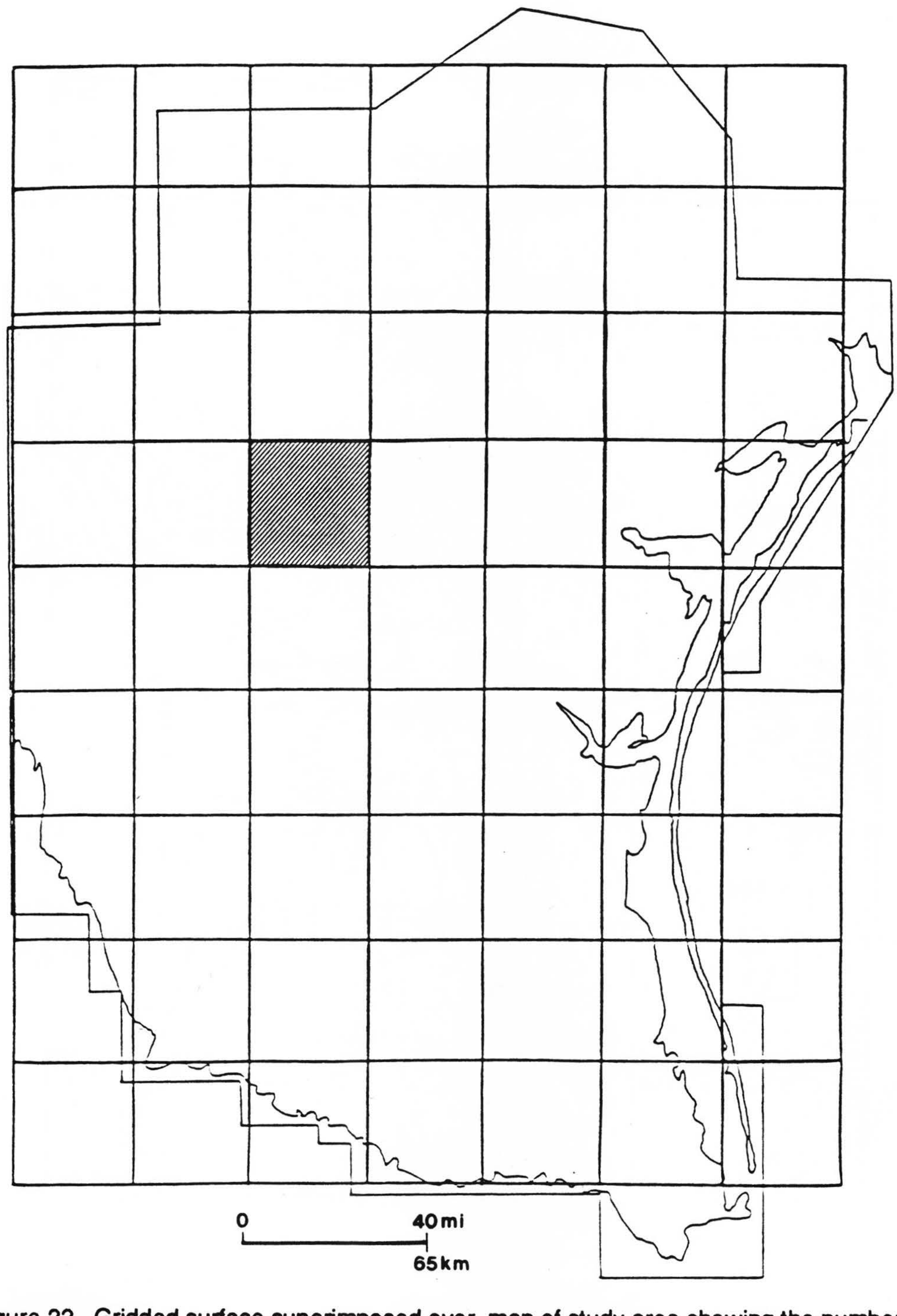


Figure 22. Gridded surface superimposed over map of study area showing the number and approximate spacing of sections used to calculate geothermal gradients. Shaded region indicates location of plots in Figures 21 and 25.

Figure 23. Gridded surface superimposed over map of study area with location of wells and growth faults.

(Fig. 21). Once these gradients were determined for each of the subregions in the study area, a contour map was made (Fig. 24). Like the isothermal surfaces, this map indicates that a zone of anomalously high temperature gradients coincides with the Wilcox growth fault trend. However, no such zone is evident within the Vicksburg/Frio growth fault trends. In addition, although Bodner (1985) shows a general increase in the overall temperature gradient to the southwest within his entire study area, Figure 24 indicates that this trend is discontinuous both within the original study area and the extended area to the south.

In looking at the temperature versus depth plots made of the overall geothermal gradients (Appendix D), it became apparent that for many of the plots the trend of the data became less steep at 6,000 to 12,000 feet (1,830 to 3,660 m) (e.g. see Fig. 25). This decrease in the slope and corresponding increase in the temperature gradient at depth has often been attributed to the presence of geopressure and the insulating effect of shales (Jones, 1970; Lewis and Rose, 1970). However, the plots which showed a change in the slope were generally located along the growth fault trends. This is significant in that there is a higher ratio of sandstone to shale along the growth fault trends, and the thermal conductivity of sandstone is typically higher than that of shale (Gretener, 1981). Thus, the growth fault trends should not be acting as insulators. Another process must be present in order to account for the elevated temperature gradients along the growth fault trends. This

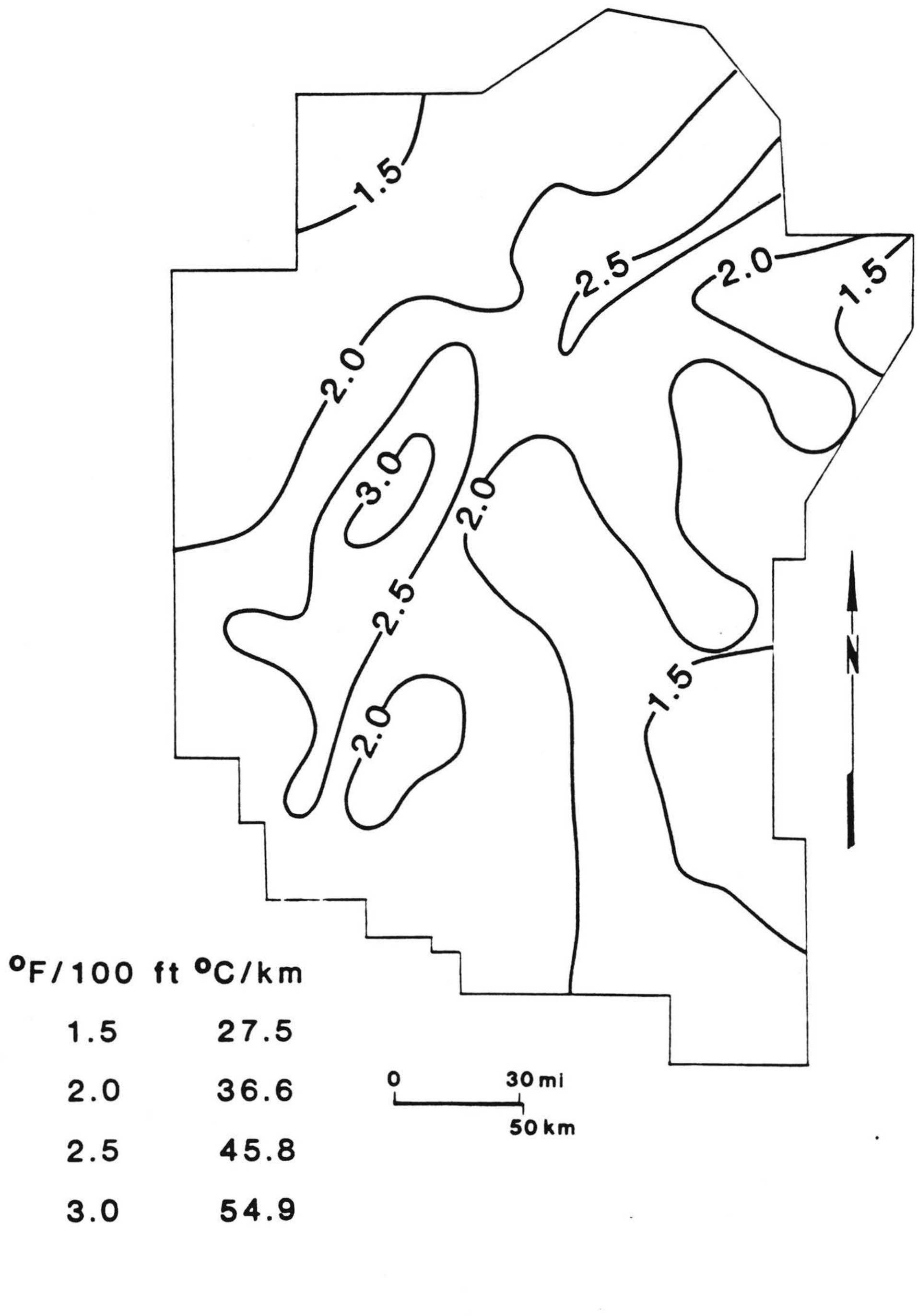


Figure 24. Contour map (°F/100 ft) of the overall geothermal gradient within the study area.

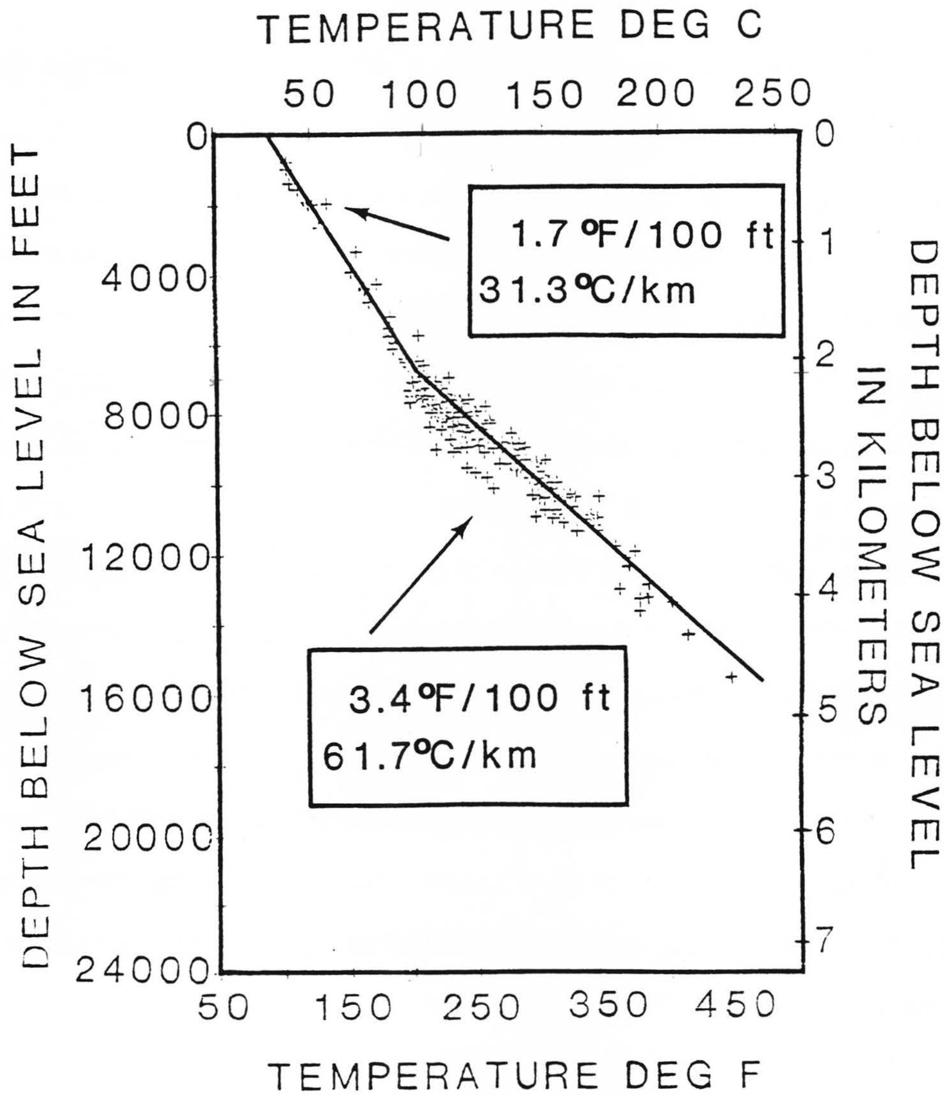


Figure 25. Temperature versus depth plot of a typical subregion along the Wilcox growth fault zone showing the change in the gradient. Location of data is shown in Figure 22.

process is hypothesized to be the advection of heat via upwelling of basin-derived fluids along the growth faults.

There are two possible reasons why plots made within the generally shale-rich section between the Wilcox growth fault zone and the Vicksburg/Frio growth fault zones showed no increase in the temperature gradient with depth. First, many plots made within the shale-rich sections between the Wilcox and the Vicksburg/Frio growth fault zones have very few data points (Fig. 23). Second, plots within the shale-rich sections that do have many data points commonly do not have data over the entire depth/temperature range (i.e., data were mostly present either above or below the top of geopressure [>0.7 psi/ft or >15.8 kPa/m] [Fig. 26], making it difficult to determine if there was a change in slope) (Appendix D). Nevertheless, it is possible that there is, in fact, no increase in the temperature gradient with depth regardless of the amount of data within the shale-rich section between the Wilcox growth fault zone and the Vicksburg/Frio growth fault zones. If this is the case, it indicates that geopressure and the insulating effect of shales do not create higher temperature gradients at depth in the shale-rich section.

A comparison made of the change in slope of the plots within the growth fault trends with a generalized map of the top of geopressure (>0.7 psi/ft or >15.8 kPa/m) (Fig. 26) revealed that the change in slope occurs as much as 2,000 to 3,000 feet (610 to 910 m) above the top of geopressure (>0.7 psi/ft or >15.8 kPa/m) along the Wilcox growth fault zone and in the southern part of the Vicksburg/Frio growth fault zone

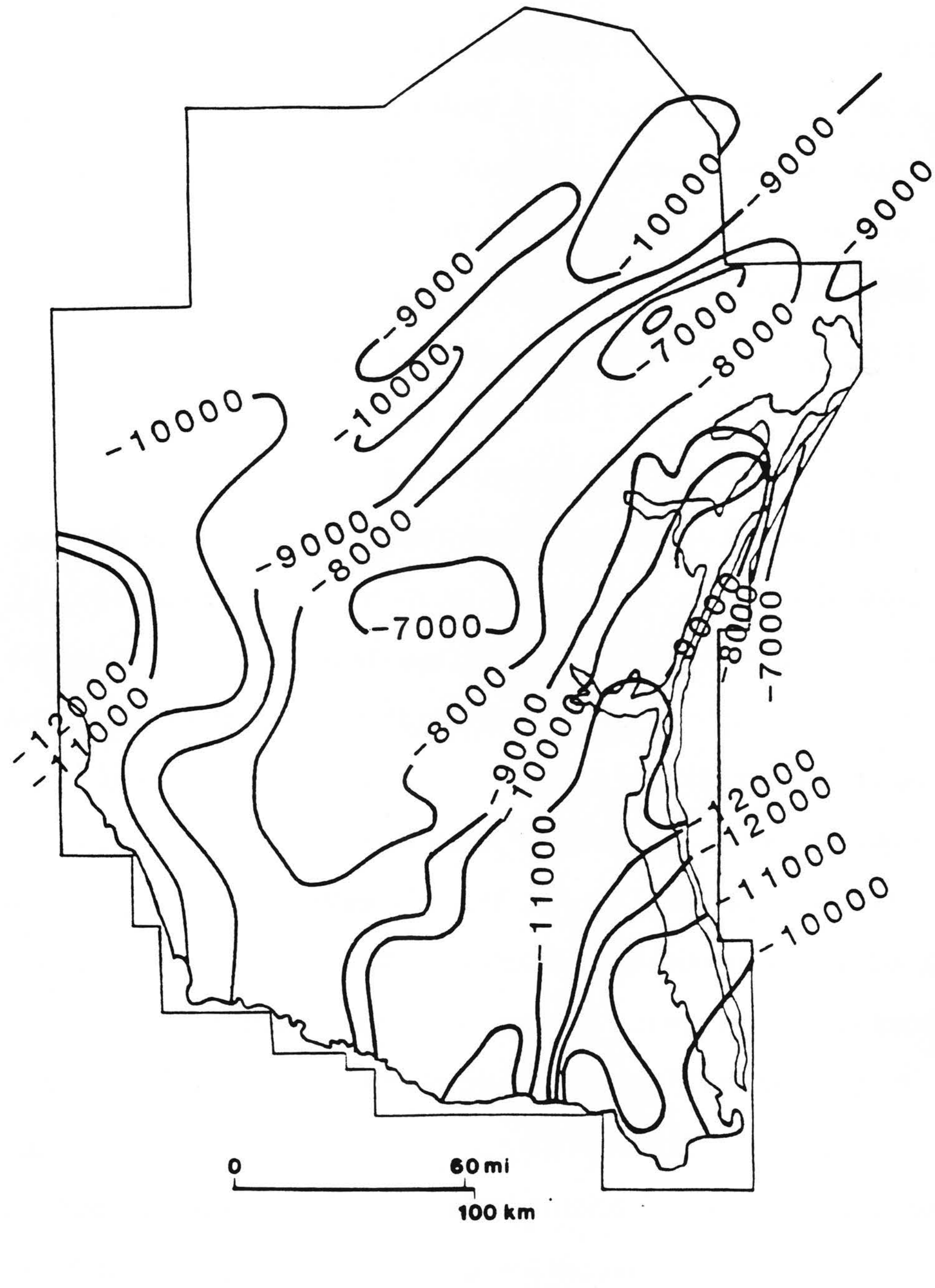


Figure 26. Contour map (in feet) of top of geopressure (>0.7psi/ft) within the study area (modified from Galloway, unpublished data, 1988).

(compare Fig. 26 with Fig. 27). There are several possibilities for this. First, the large depth difference between the change in slope and the top of geopressure (>0.7 psi/ft or 15.8 kPa/m) may indicate that a large transition zone of the pressure gradient (0.465 to 0.7 psi/ft or 10.5 to 15.8 kPa/m) exists in these areas causing the temperature gradients to be higher at a shallower depth. For example, a pressure versus depth plot from data along the Wilcox growth fault zone in Zapata County shows a transition zone nearly 3,000 feet (910 m) thick (Fig. 28). Second, perhaps the higher temperature gradients at shallower depths reflect the influence of advection of heat by upward-moving fluids. If this is the case, it indicates that hot fluids are moving up out of the geopressured, compactional regime and perturbing the temperature field in the overlying meteoric regime. One way to test this last hypothesis would be to use numerical modeling to see what pressures, fluid fluxes, etc. would be needed in order for fluid to escape from the geopressured, compactional regime and flow into the overlying meteoric regime. A second test of the hypothesis would be to examine petrographic data both above and below the top of geopressure for comparison.

In order to take into account the change in slope of the data points over the entire depth/temperature range, two additional contour maps of the temperature gradients were generated. Figure 29 depicts the temperature gradients below the change in slope of the data. In general, these gradients are within the geopressured, compactional regime. Several areas along the Wilcox growth fault trend possess

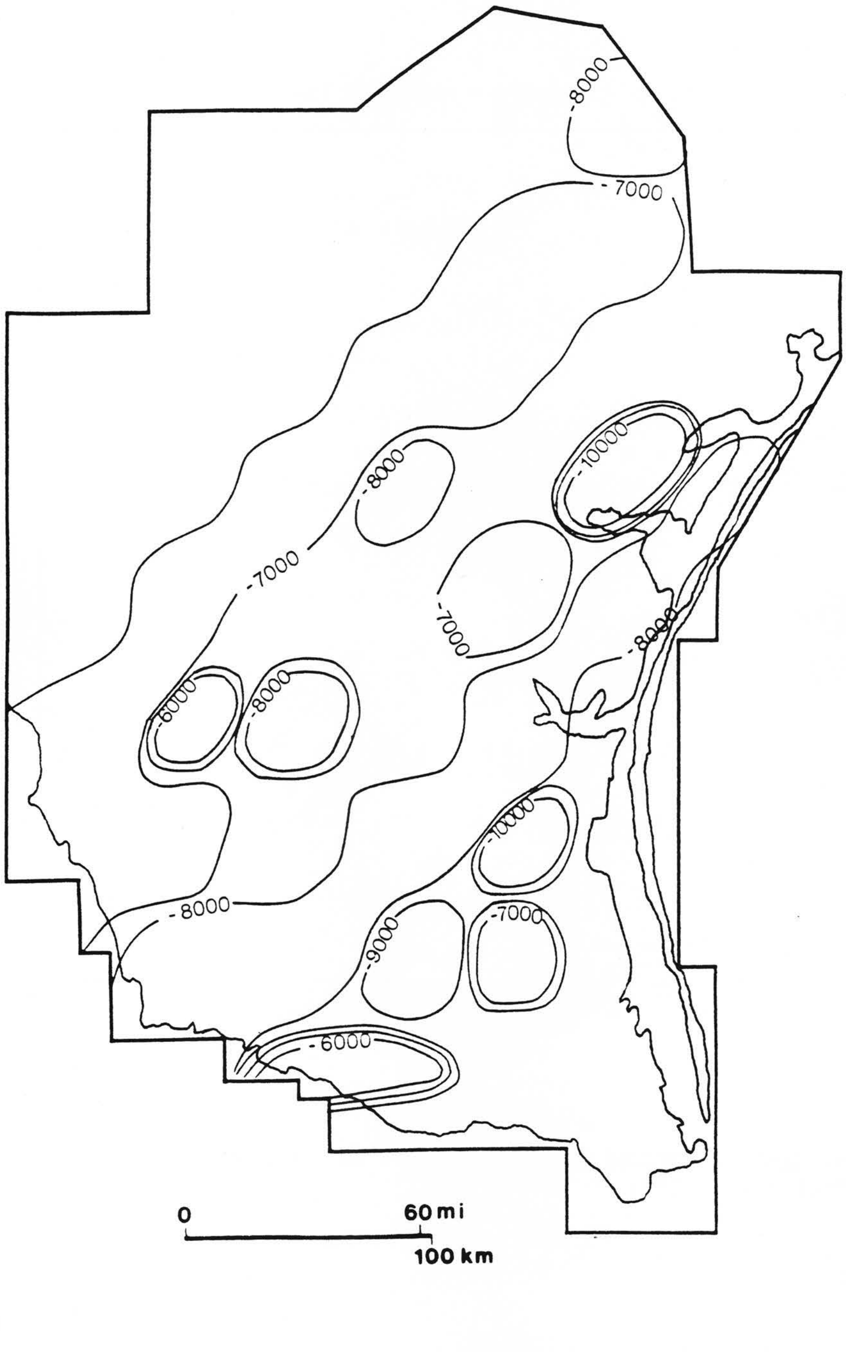


Figure 27. Contour map (in feet) of depth to change in the gradient within the study area.

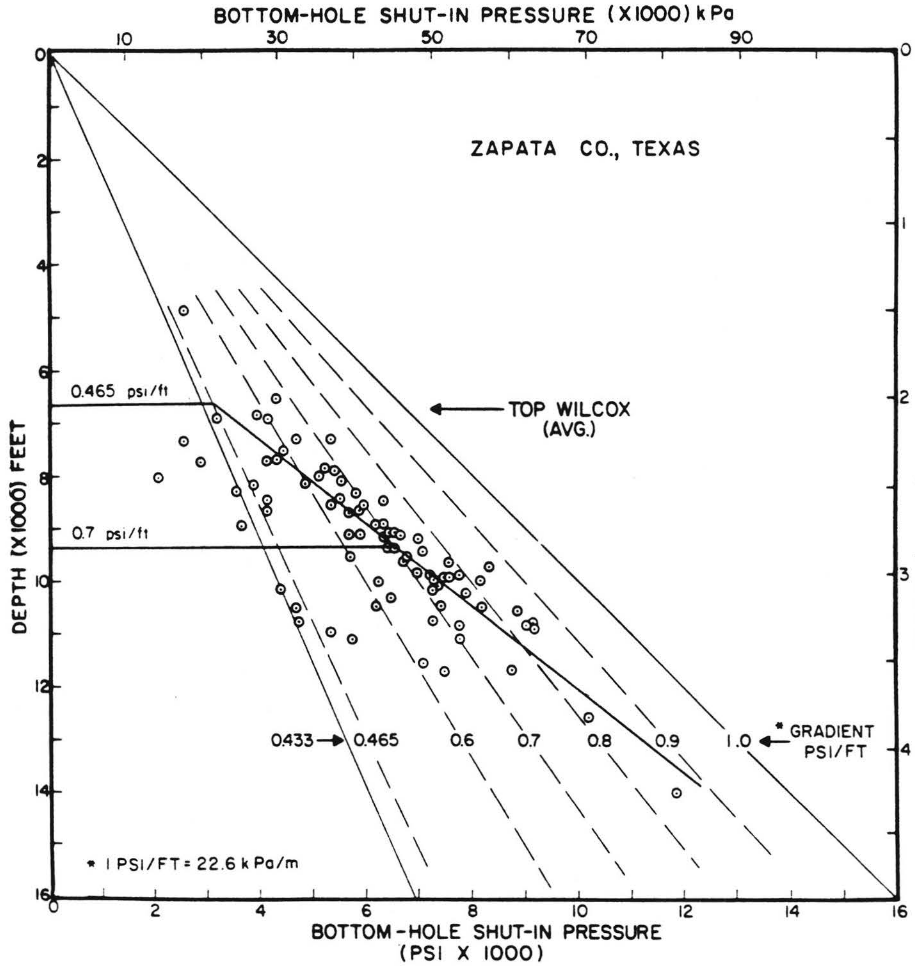
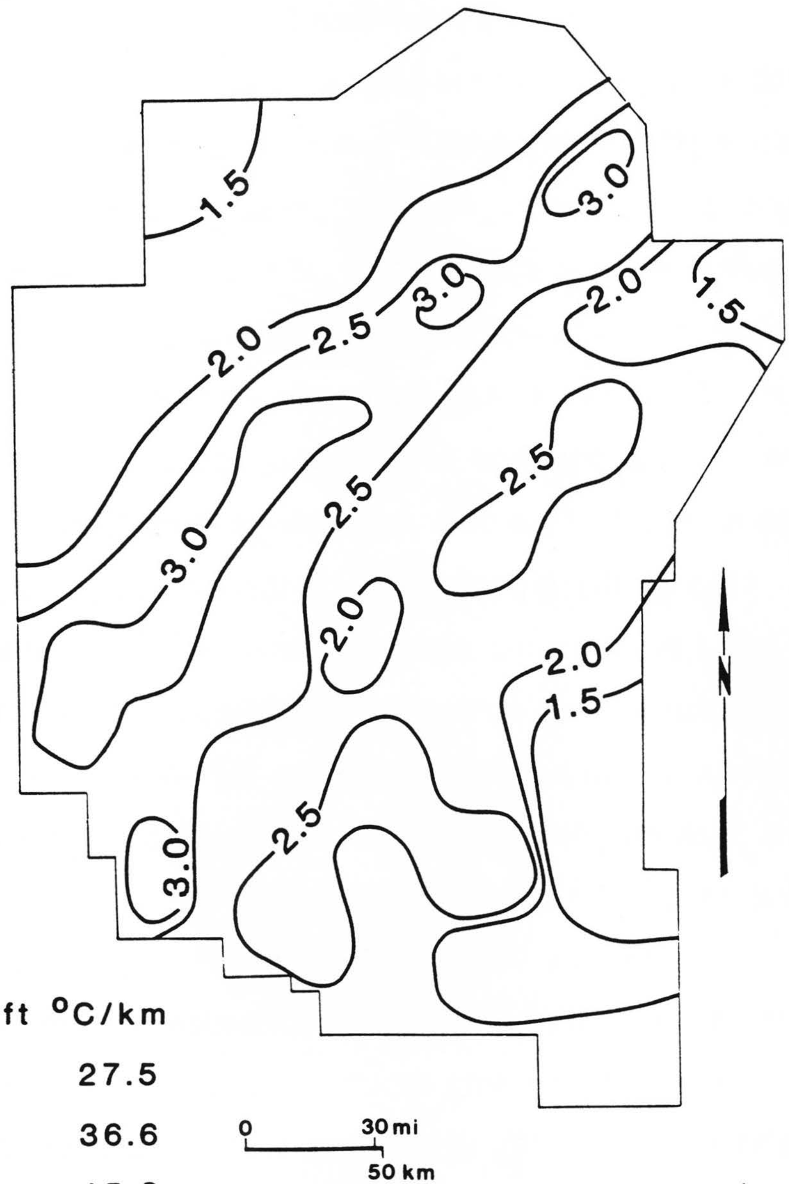


Figure 28. Bottom-hole shut-in pressure versus depth plot for Zapata County (from Bebout and others, 1982).

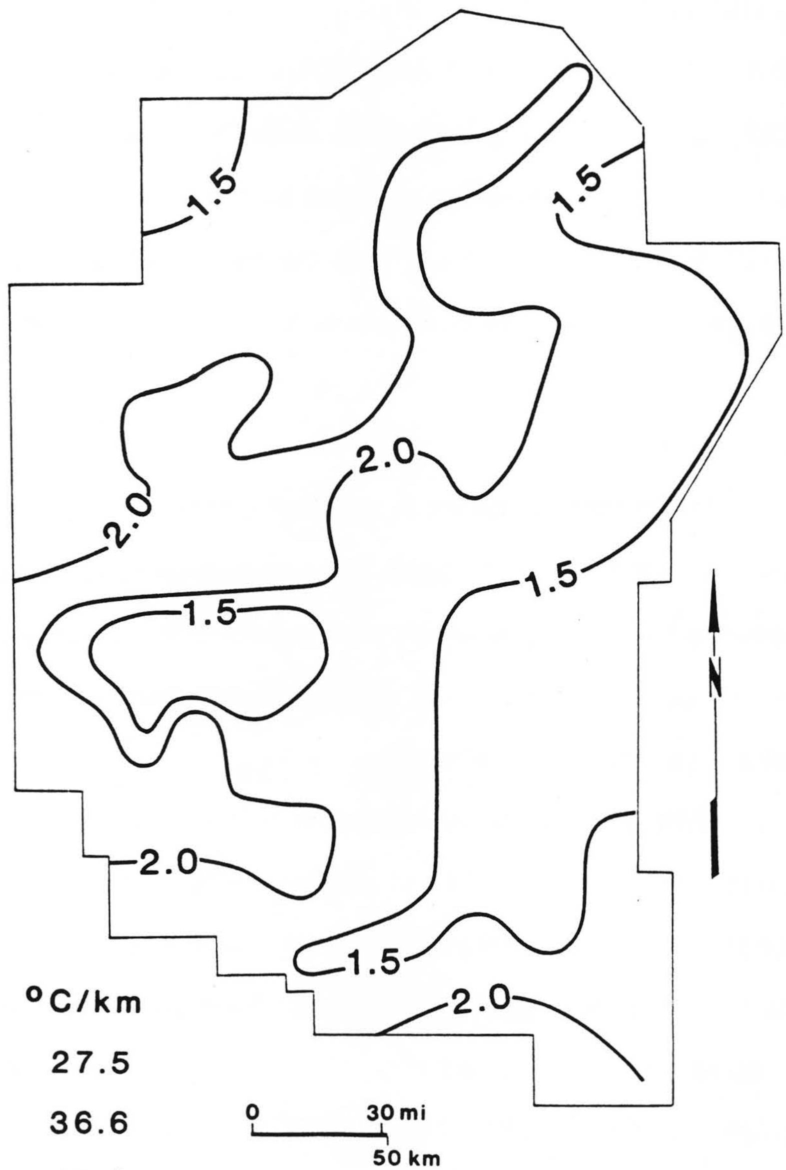


°F/100 ft	°C/km
1.5	27.5
2.0	36.6
2.5	45.8
3.0	54.9

Figure 29. Contour map (°F/100 ft) of the geothermal gradient below the change in slope.

temperature gradients of greater than 3°F/100 ft (54.9°C/km). These areas correlate with the Wilcox geothermal fairways discussed by Bebout and others (1982). In addition, unlike the isothermal surfaces on the contour map of the overall geothermal gradients, this map shows that two subtle perturbations of > 2.5°F/100 ft (45.8°C/km) are present within the Vicksburg/Frio growth fault zones at depths of greater than 6,000 feet (1830 m). These two areas roughly coincide with large sand packages (Loucks, 1979; Bebout and others, 1975) and the southernmost sand package is covered by a thick sequence of shale (Bebout and others, 1975). Although these perturbations in the Vicksburg/Frio growth fault zones could be attributed to the insulation effects of shales, this is unlikely because other parts of the study area with similar lithologic characteristics, such as the area between the Wilcox growth fault zone and the Vicksburg/Frio growth fault zones, do not have elevated temperature gradients. Thus, it is hypothesized that the subtle perturbations within the Vicksburg/Frio growth fault zones are the result of advection of heat via upward-moving fluids along the growth faults.

The last contour map depicts temperature gradients above the change in slope (Fig. 30). In general, these gradients are within the meteoric regime. The map reveals that as with Figures 24 and 29 there is a zone of higher temperature gradients which coincides with the Wilcox growth fault zone. This is important because it implies that advecting fluids moving upward through the growth faults are escaping from the geopressured, compactional regime and perturbing the



°F/100 ft	°C/km
1.5	27.5
2.0	36.6
2.5	45.8
3.0	54.9

Figure 30. Contour map (°F/100 ft) of the geothermal gradient above the change in slope.

temperature field in the overlying meteoric regime. In addition, the position of the 2.0°F/100 ft (36.6°C/km) contour line slightly updip and downdip of the Wilcox growth fault zone indicates that the temperature patterns may be somewhat affected by groundwater movement in the meteoric regime. Appendix E lists the temperature gradients and their corresponding correlation coefficients for all of the subregions plotted.

Other Evidence

The thermal patterns in the Gulf Coast basin suggest that growth faults are acting as conduits for upward-moving fluids. There is, however, other evidence which also supports this including oil migration, uranium deposits, siliceous knobs, petrographic and geochemical studies, and water chemistry data.

With respect to oil migration within the Gulf Coast basin, the presence of many oil fields at shallow depths above the "oil window" suggests that the oil migrated vertically along growth faults. In addition, some hydrocarbons have ages different from the reservoirs in which they are found (Young and others, 1977; Dow, 1978). In fact, oil age calculations (Young and others, 1977) of some offshore Gulf Coast oils showed that the oils are 8.7 million years older than their reservoirs. This time difference indicates that the oils migrated vertically an average of 11,000 feet (3,350 m). The distribution of South Texas oil and gas fields (as shown by the concentration of wells in Figure 10) also suggests that migration of oil has occurred along growth faults. Finally, vitrinitereflectance data, supported by hydrocarbon-maturation data and anomalous concentrations of C_5 to C_7 hydrocarbons indicate that the upper Frio has been invaded by hot hydrocarbon fluids moving up through growth faults (Tyler and others, 1985).

A study of uranium deposits in outcrop and shallow subsurface along the Wilcox growth fault zone in Live Oak County showed that the sulfide alteration within these deposits contains sulfur isotope compositions found only in the Mesozoic carbonates beneath the basin fill (Galloway, 1982). This indicates not only that upward fluid migration occurred along the growth faults, but that the fluid migration continued to a shallow depth.

Siliceous knobs are found at the surface along the Wilcox growth fault zone in McMullen County just north of the area of highest overall geothermal gradients (>3.0°F/100 ft or 54.9°C/km) in the study area (Fig. 24). These knobs were originally interpreted as representing Tertiary mud-volcano vents or cones (Freeman, 1966). However, further study indicates that these knobs precipitated from hot fluids that moved upward through the growth faults and cooled near the surface (E. McBride, personal communication, 1988). Like the uranium studies, this indicates that fluids have moved upward through growth faults into the shallowest hydrologic section of the sedimentary pile - the meteoric regime.

Numerous petrographic and geochemical studies have indicated that fluid flow has been a very important control on the diagenesis of Tertiary sediments in the Gulf Coast basin (e.g., Land and others, 1987).

Several diagenetic effects, cementation by quartz and kaolinite, grain dissolution, albitization, and transformation of smectite to illite, are observed at shallower depths in older Cenozoic units of the Gulf Coast basin in response to the combined effects of high temperature gradients and fluid flow (Land and others, 1987).

Finally, water chemistry data indicate that deep basinal fluids are moving up through the growth fault zones in several areas of South Texas. Specifically, Morton and Land (1987) discuss the presence of Ca-rich waters in the Frio Formation which moved up growth faults from underlying Mesozoic strata. In addition, local and regional salinity studies in South Texas by Morton and others (1981,1983) indicate that the migration pathways of upwelling fluids are growth faults (Tyler and others, 1985).

Summary

Isothermal surfaces and temperature gradients demonstrate similar patterns of subsurface thermal variation in the South Texas Gulf Coast basin. First, both the isothermal surfaces and the temperature gradient contour maps show that a prominent ridge of elevated temperatures is present along the Wilcox growth fault zone. Second, both show that the elevated temperatures are not only along but also offset coastward of the Wilcox growth fault zone. Because many sand packages are located just downdip of the growth faults (Fig. 2), the offset in the temperature anomaly may be the result of lateral migration of advecting fluids along the sand-rich intervals (Fig. 31). Third, both indicate that fluids may be escaping from the geopressured, compactional regime and perturbing the temperature field in the overlying meteoric regime (Fig. 32). Fourth, both the isothermal surfaces and the temperature gradient contour maps show two regions of cooler temperatures along the Texas Gulf Coast. The cool area to the southeast corresponds to a major early Miocene depocenter. The other cool area to the northeast in the vicinity of Refugio and Goliad counties is on the southern end of another Miocene depocenter (Doyle, 1976; Galloway and others, 1986). Because the two Miocene depocenters contain the youngest sediments in the study area, the cooler temperatures may indicate that these sediments have not had enough time to equilibrate with the present thermal regime. Fifth, both the isothermal surfaces and the temperature gradient contour maps show an area of cooler temperatures updip from the Wilcox growth fault zone. The cooler temperatures are probably the result of Cretaceous limestones which have high thermal conductivities.

Although both the isothermal surfaces and the temperature gradient contour maps show much the same thermal trends, they differ with respect to two areas in the Vicksburg/Frio growth fault zones in which elevated temperature gradients only appear on the contour map of gradients below the change in slope (Fig. 29). Because the elevated temperature gradients in these areas are only slightly higher than 2.5°F/100 ft (45.8°C/km) and appear at depths of greater than 6,000 feet

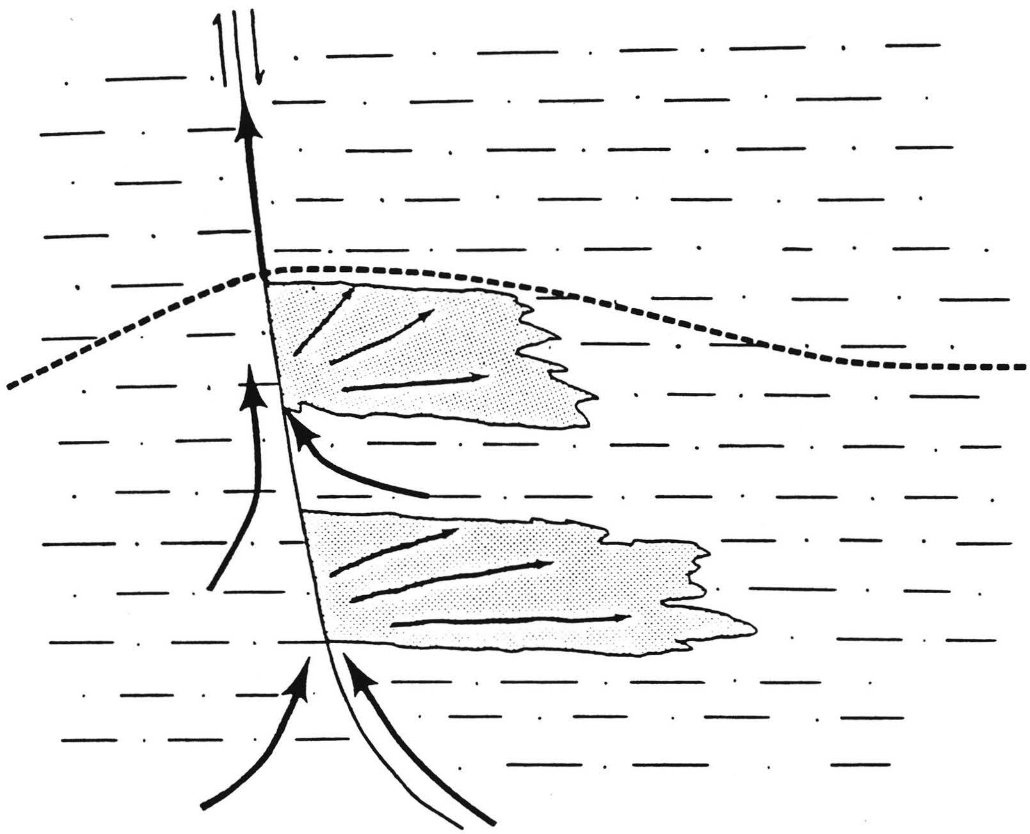


Figure 31. Sketch of lateral migration of advecting fluids along the sand-rich intervals of the Wilcox growth fault zone. Dashed line indicates isotherm.

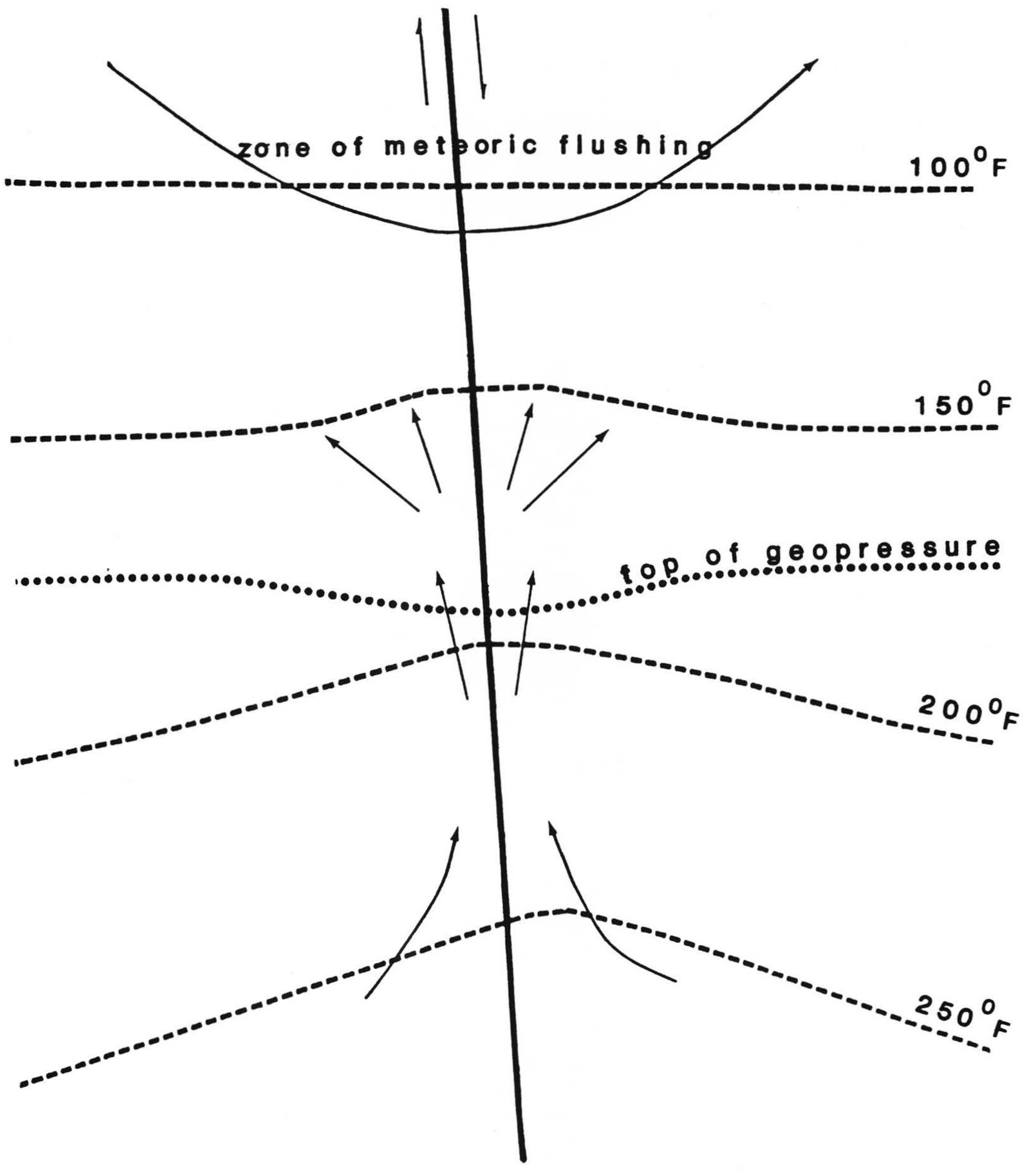


Figure 32. Sketch of fluids escaping from the geopressured, compactional regime and perturbing the temperature field in the overlying meteoric regime. Dashed lines indicate isotherms (°F).

(1830 m), it is possible that they are too subtle to have been detected by the isothermal surface maps or the contour map of the overall geothermal gradients. This implies that the advection of heat via upwelling basinal fluids is not as effective in the Vicksburg/Frio growth fault zones as in the Wilcox growth fault zone.

V. CONCLUSIONS

This thesis extends the earlier study of Bodner (1985), and has answered several of the questions raised by that study. First, it has been determined that meteoric waters do damp out the thermal anomaly along the Wilcox growth fault zone for depths corresponding to the 100°F isotherm. However, at depths corresponding to the 150°F isotherm, a thermal anomaly begins to emerge along the Wilcox growth fault zone. This is important because these depths are much too shallow to lie within the geopressured, compactional regime and thus must lie within the overlying meteoric regime. The anomaly within the 150°F isotherm suggests that advecting fluids - albeit not large in volume because large amounts of flux over geologic time would rapidly bleed off the existing geopressure - are escaping via growth faults from the geopressured, compactional regime and perturbing the temperature field in the overlying meteoric regime, a fact also implied by the contour map of temperature gradients within the meteoric regime.

Although Bodner (1985) found that the temperature gradients in his study area generally increase to the southwest, temperature gradients taken on a finer scale within the original study area and the extended area to the south (Fig. 1) show that the trend is discontinuous. Thus, it appears unlikely that there is a trend of increasing temperatures toward the southwest over the entire study area.

Only two areas within the geopressured, compactional regime of the Vicksburg/Frio growth fault zones were found to have elevated temperature gradients (> 2.5°F/100 ft or > 45.8°C/km). However, a definite thermal anomaly exists along the Wilcox growth fault zone that appears in both the geopressured, compactional regime and the overlying meteoric regime. Thus, the question arises as to why such an anomaly is present in the Wilcox growth fault zone but not in the Vicksburg/Frio growth fault zones. Although there are no definite answers to this question, there are several possibilities as to why the Wilcox is unique in having a thermal anomaly associated with it. First, the Wilcox trend is different from the Vicksburg/Frio growth fault trends in that it lies at a major lithologic break - the Cretaceous shelf margin. In addition, although it is unknown whether or not the Vicksburg/Frio growth fault zones have a connection with the underlying Mesozoic strata because of the limits in seismic resolution, the Wilcox growth fault zone has roots in the Mesozoic (W. Galloway, personal communication, 1988). Thus, it is possible that structural differences in the fault zones accounts for the presence of a major thermal anomaly only within the Wilcox growth fault zone. Second, the Balcones-Ouachita trend of Central Texas, which is updip of the Wilcox growth fault zone, is also associated with regionally high geothermal gradients (Woodruff and Foley, 1985). This suggests that because the Vicksburg/Frio growth fault zones are younger than the Wilcox growth fault zone and the Balcones-Ouachita trend, the Vicksburg/Frio zones have not had time to equilibrate with the existing thermal regime. Third, a fault is normally pressure sealing and thus fluid movement in the fault occurs during major fault movement when the fault is open over a portion of its length (Pilkington, 1988). Perhaps growth faults are sealed at different depths in many more areas along the Vicksburg/Frio growth fault zone than along the Wilcox growth fault zone. If widespread pressure sealing is occurring in the Vicksburg/Frio growth fault zones, it is probable that it is retarding the movement of advecting fluids and thus, minimizing any perturbation in the temperature field.

In summary, approximately 2200 oil and gas well log headers and over 5200 depth/temperature pairs were analyzed for this study. Although temperature measurements from well logs are not always considered to be accurate (Speece, 1985), the data for this study are remarkably consistent in part because of the large data set. Examples of the good correlation in the data include the following: 1) similar thermal patterns shown by both isothermal surfaces and temperature gradients, and 2) excellent correlation coefficients of temperature gradients taken in the study area (Appendix E).

The subsurface of the South Texas, Gulf Coast basin is a dynamic system in which fluid flow plays an important role within the meteoric, compactional, and thermobaric regimes. Specifically, fluid flow is linked to thermal variations as well as diagenesis within the Cenozoic sediments. Isothermal surfaces and temperature gradients indicate that a major thermal anomaly coincides with the Wilcox growth fault zone but not with the Vicksburg/Frio growth fault zone. In addition, although Gretener (1981) shows that thermal conductivity differences among different rock types decrease with depth, isothermal surfaces indicate that the anomaly becomes more prominent with depth (Fig. 19). This indicates the importance of some other mechanism which is hypothesized to be the advection of heat via upward-moving fluids along the growth faults. Both isothermal surfaces (Figs. 13b and 13c) and temperature gradients (Fig. 30) suggest that advecting fluids are escaping the geopressured, compactional regime via growth faults and perturbing the temperature field in the overlying meteoric regime. Finally, an inverse relationship between the overall geothermal gradient and sediment thickness exists in the South Texas portion of the Gulf Coast basin much like other basins, such as the Niger Delta sedimentary basin (Nwachukwu, 1976).

Clearly more study is appropriate on the subject of thermal anomalies in the South Texas portion of the Gulf Coast basin. Some questions remain from Bodner's study and new questions have been raised by this one. Specifically, the results presented in this thesis should be combined with petrographic, water chemistry and numerical modeling studies. For example, although many sandstone diagenesis studies have been done in South Texas, more shale diagenesis studies need to be done in order to determine how thermal variations and fluid flow in South Texas are related to shale diagenesis (W. Macpherson, personal communication, 1988). In addition, more work should be done on differences in diagenesis above and below the top of geopressure. Finally, petrographic studies done in areas of very high geothermal gradients along the Wilcox growth fault zone (Figs. 24 and 29) could give a better understanding of the processes that are occurring in these areas.

With respect to water chemistry, more brine sampling should be done in all areas of South Texas (W. Macpherson, personal communication, 1988) and especially along the Wilcox growth fault zone (L. Land, personal communication, 1988). The samples could then be analyzed to determine how brine waters are related to higher temperature gradients along the Wilcox growth fault zone and in the two areas of the Vicksburg/Frio growth fault zones.

Numerical modeling studies would also be of great benefit because they could be used to determine whether or not fluid movement along the growth faults is steady-state or transient in nature. In addition, these studies could be used to give quantitative measurements on the fluid flux along the growth faults.

Thus, much work remains to be done in order to present a clear picture of how thermal variations are related to other processes taking place in South Texas. It is hoped that the results presented in this thesis in combination with petrographic, water chemistry and numerical modeling studies will give a better understanding of the interactions taking place in the South Texas portion of the Gulf of Mexico sedimentary basin.

APPENDIX A:CROSS-REFERENCE LIST

This cross-reference list consists of well numbers and their corresponding Tobin grid numbers and well names. The list is by increasing Tobin grid number and only includes data collected for this study. However, well numbers of less than 765 correspond to wells used in Bodner's study for which temperature data of less than 200^{o}F were available. Because he did not look at these data, they were included in this study. For a cross-reference list of wells used in Bodner's study, see Bodner (1985), his appendix A.

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
702	8S-13E-6	Petro Tex, #1 Garcia	2074	11S-18E-7	Union Prod, #19 Ray
723	8S-21E-4	Shell, #1 Brown	245	11S-18E-9	Cox et al, #1 Copeland
724	8S-21E-6	Superior, #1 Blackwell et al	2075	11S-18E-4	Frio Drlg, #2 Grissom
725	8S-21E-1	Gulf, #1 Mueller	2076	11S-18E-9	TN Gas, #B-1 Dahl
726	8S-21E-7	Commonwealth, #1 Richards	2077	11S-18E-2	Sohio et al, #1 Nichols
703	9S-12E-9	Skelly, #1 Winkler	257	11S-19E-5	Fly, #1 Key
2010	9S-12E-2	Lone Star, #1 Walton	256	11S-19E-7	Coastal St, #1 Mckinney
89	9S-13E-7	Carthay, #1 Brite	254	11S-19E-8	Viking Drlg, #1 Ray
2011	9S-14E-6	Farenthold et al, #1 Harris	255	11S-19E-7	Brown, #1 Pereira
91	9S-14E-3	Sorelle, #1 Heinen	250	11S-19E-1	Haring et al, #1 Powell
2012	9S-16E-4	Texita et al, #1 Luckett	2078	11S-19E-1	Southland, #1 Johnson
2013	9S-16E-3	Armer et al, #1 Pawlik	249	11S-19E-7	TX Eastern, #1 Hall
95	9S-16E-1	Seaboard, #1 Szalwinski	2080	11S-19E-7	Powers Oper, #1 Petus
42	9S-19E-7	TX Eastern, #1 Garbe	253	11S-19E-4	Miller&Fox, #1 Lott
45	9S-19E-7	TX Eastern, #1 Woskon	2081	11S-19E-4	Miller&Fox, #1 Deer et al
2015	9S-21E-3	Socony, #1 Berck	266	11S-20E-9	Relco, #1 Gantt
2018	9S-21E-7	Monsanto, #1 Fields	264	11S-20E-4	Gen. Crude, #1 Pettus
2019	9S-21E-9	Foree, #1 Hartman	262	11S-20E-6	Humble, #1 Neese
2024	9S-21E	Monsanto, #2 Gerbert Gas	259	11S-20E-6	Abel&Bancroft, #2Ramsey
2025	9S-21E-1	Harkins et al, #1 Duderstadt	2083	11S-20E	Howell et al, #1 Coutret
2028	9S-21E	Mitchell, #1 Kaczmarek	265	11S-20E-9	Cattle Land Oil, #1 Gantt
684	9S-21E-9	Atl. Refining, #1 Kerlick	2084	11S-21E	Cosden Petro, #2 Crews
682	9S-21E-9	Lone Star, #1 Gips	2085	11S-21E-1	Halbouty et al, #1 Dohlen
102	10S-16E-8	Hunt, #1 Hardt	2086	11S-21E	Sinclair et al, #1 Sievers
2036	10S-17E-9	Coyle, #1 Esse	2087	11S-21E-4	Cosden Petro, #1 Crews
69	10S-18E-9	Gen. Crude, #1 McDowell	32	11S-21E-1	TX Oil&Gas, #1-A Richter
74	10S-18E-5	Hunt, #1 Huckman	2090	12S-12E-5	Gilcrease, #1 Franklin
2037	10S-18E-1	Gen. Crude, #1 Tipps	2091	12S-12E-6	Gilcrease, #1-A Roark
72	10S-18E-6	Bruns, #1 Tips	2092	12S-12E-7	Standard, #1 Wheeler
2038	10S-18E	Gen. Crude, #1 Alexander	2093	12S-12E-6	Arnold Well, #1 Morgan
2039	10S-18E-8	Shamrock, #2 Nichols et al	106	12S-13E-8	Continental, #1 Horton
78	10S-19E-1	Cities Serv., #1 A Stanchos	107	12S-13E-6	Tenneco, #1 Jambers
77	10S-19E-2	Argo, #1 A Dittmer	2095	12S-13E-8	Hillier, #1 Thetford
2040	10S-19E-2	Mobil, #1 Speary	109	12S-14E	TX Eastern, #1 Atkinson
2042	10S-19E-9	Shell, #1 Atkinson	111	12S-15E-7	Tenneco, #1 Schulz
76	10S-19E-8	Hunt, #1 Zavesky	2096	12S-16E	LaGloria, #1 Benham
2044	10S-20E-7	Houston Nat.Gas,#2Bethke	2097	12S-16E-7	Kirkwood, #1 Temtlin
2045	10S-21E-5	Helland et al, #1 Pitman	2098	12S-16E-7	LaGloria, #1 Kerbey
2046	10S-21E-7	Houston Oil, #1 Martin	2099	12S-16E-6	LaGloria, #1 Zamzow
2047	10S-21E-4	McBride, #4 Busby	2100	12S-16E-7	Kirkwood, #1 Stridde
2048	10S-21E-4	Herman, #1 Gruetzmacher	112	12S-16E-2	Pickens, #1 Meyer
694	10S-21E-7	Houston Oil, #1 Fromme	2101	12S-16E-8	Shenandoah, #3 Probst
2052	10S-21E-2	Hamill, #1 Dohman	118	12S-16E-1	Shell, #1 Leppard
2054	10S-21E	Atl. Refining, #1 Kerlick	2102	12S-16E-6	N.Pump, #1 House
2056	10S-21E-6	TX Oil&Gas, #1 D Hoff	2103	12S-16E-7	Huisache, #1-A Choate
2062	10S-21E-2	Harkins, #1 Diebel	2104	12S-16E-8	Shenandoah, #1 Braune
2063	10S-21E-6	Harkins, #1 Jacobs	271	12S-17E-3	Shell, #1 Tomasek et al
2065	10S-21E-1	Harkins, #1 Dohman	272	12S-17E-3	Shell, #1 O'Neal
2066	10S-21E-6	Harkins et al, #1 Kerlick	2105	12S-17E-8	Grande et al, #1 Knight
2067	11S-14E-1	Hedley et al, #1 Tom	2106	12S-17E-7	Zachry, #1-A Bast
2069	11S-14E-6	Harrison, #1 Tom	2107	12S-17E-8	Dugger, #1 Knight
104	11S-15E-1	Stewart, #1 Mcilvaine et al	2108	12S-17E-2	Carrl et al, #1 Copeland
241	11S-17E-6	Spartan, #1 Tips	2109	12S-17E-9	N. Pump et al,#1-A Hall
238	11S-17E	MGF Oil, #1 Zuniga	2110	12S-17E-4	TX Oil&Gas, #1-A Knight
242	11S-18E-5	Union Prod, #2 Spielmagen	2111	12S-17E-8	Tidewater, #1 Beck
2073	11S-18E-7	Pennzoil, #10 Ray	2112	12S-17E-9	Stanolind, #5 Hall

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
2114	12S-17E-2	Forest, #1 Borroum B-C	2178	13S-16E-2	ServContr., #2Goebel
2115	12S-17E-2	Southland, #1 Barber	2179	13S-16E-2	ServContr., #1Goeble
2116	12S-17E-9	Dyco, #1 Ballard	138	13S-16E-1	Hanson et al, #1 Maguglin
2118	12S-17E-8	Skelly, #1 Marshall	305	13S-17E-3	Cities Serv., #B-1 Beck
273	12S-17E-7	Zachry, #C-1 Holzmark	2180	13S-17E-2	Bright&Schiff#1Schoolfd.
267	12S-17E-3	Shell, #1 Alvarado et al	307	13S-17E-2	Hamon, #1 Ragsdale
2120	12S-18E-2	TX Pacific, #9 Freeland	302	13S-17E-2	TX Co., #1 Ragsdale
2125	12S-18E-2	Harris, #3 Hall W. Tuleta	2181	13S-17E-4	Hanson&Hurt, #1 Blanken
2128	12S-18E-4	Texaco, #1 Harris	309	13S-17E-8	CO Oil&Gas, #1 Choate
2130	12S-18E-9	Comm. Prod, #4 Pressey	2183	13S-17E-2	TX Crude, #1 Brown
2131	12S-18E-2	Fly, #6 Ray	2185	13S-17E-7	Milligan, #4 McCord
2132	12S-18E-7	TN Gas, #1 Johnson-Beck	2186	13S-17E-3	Tidewater, #1 Manning
2133	12S-18E-3	Fly, #4 Hall	315	13S-18E-8	Sunray, D-X, #1 May
2134	12S-18E-2	Fly, #5 Hall	311	13S-18E-2	Carrl&Leahy, #1 John
2136	12S-18E-8	Lone Star, #1 May	317	13S-18E-3	Texaco, #1 Littlejohn
2138	12S-18E-8	Lone Star, #A-1 Sinclair	321	13S-18E-2	Dougherty, #2 Perez
2139	12S-18E-4	Zachry, #1 Miller	2189	13S-18E-8	Atl.Richfield, #1 Daugherty
2141	12S-18E-5	Skelly, #1 Hill	324	13S-18E-4	McCormick, #1 Kearns
275	12S-18E-7	Coastal States, #1-A Scott	331	13S-21E-9	Pure Oil, #B-1 O'Brien
2143	12S-18E	Hughes,#1Mckinney	2190	13S-21E-1	Ginther, #12 Wood
2144	12S-18E-5	Coastal States, #1 Dirks	2191	14S-7E-8	Haas, #1-5 Evans
2146	12S-18E-6	Staples, #1 Haris	2192	14S-7E-7	Shell, #1 Martin
2147	12S-18E-7	Pace et al, #1 Scott	715	14S-7E-1	Bass, #1 Johnson et al
2149	12S-18E-7	Atl.Refng., #1 Beck	2193	14S-8E	Sutton, #1 Stone
294	12S-19E-6	Coastal States, #4 McCord	716	14S-8E-5	Stanolind, #1 Cooke
2151	12S-19E-1	Coastal States, #2 McCord	2194	14S-8E-6	Sutton, #6-B Cartwright
292	12S-19E-1	Coastal States, #3 McCord	2196	14S-10E-1	Phillips, #3 Mula
2152	12S-19E	Evans, #1-A Blanco Crk	2197	14S-10E-2	Shamrock, #1-31 Alamo
2153	12S-19E-1	Texaco, #1 Wilson	2198	14S-10E-5	Frost, #4 S TX Syndicate
290	12S-19E-4	Kissinger, #1 Kidd	2199	14S-11E-3	Gilcrease, #1 Alamo Bank
2154	12S-19E-4	TX Eastern, #1 Kidd	381	14S-11E-6	Amerada Petr, #1 Grimes
2155	12S-19E	Coastal States, #1 Wilson	2200	14S-14E-5	Magnolia, #1 Block-86
295	12S-19E-2	Forest, #1 Fst.Victoria Ntl	154	14S-14E-4	Texam, #1 Hays-Ezzell
296	12S-19E-3	Forest, #1 Ray	2201	14S-14E-5	Varn Petro, #1 Skaggs
2157	12S-24E-5	Harkins, #1 Simmons	2202	14S-14E-6	Scoggins et al, #1 Schmid
2158	13S-9E-9	Sutton, #2 Pfluger	2205	14S-14E-8	Texaco, #2 Riser
2159	13S-9E-9	Sutton, #1 Pfluger	2206	14S-14E-7	MPS et al, #1 Dougherty
2161	13S-11E-6	Forest et al, #2 Dilworth	2209	14S-15E-2	Natl. Exp., #2 Schreiner
2162	13S-11E-3	Fasken, #1 Henry	2210	14S-15E-9	Cattle Land, #1 Nesloney
375	13S-12E	Pan Am, #1 McClaugherty	167	14S-15E-9	Warren, #1 Whitley-John.
2164	13S-12E-9	Standard, #1 Wheeler	2211	14S-15E	Atl.Refining, #11 Lyne
131	13S-14E-3	Standard, #1 Calliham	2212	14S-15E-5	Sanchez-OBrien, #1 Brysch
132	13S-14E-1	Standard, #1 Isaacks	176	14S-15E-6	Argo, #1 Braslau
2165	13S-14E-7	Herring, #1 Valentine	2214	14S-15E-6	Republic Nat.Gas, #1 Owens
2167	13S-15E-8	Tex-Star Oil, #1 Smith	2216	14S-15E-1	Harkins et al, #1 Smith
2168	13S-15E-6	Carr, #B-1 West	2217	14S-15E-8	Kilroy, #1 Burns
2171	13S-16E-3	Lingen Expl., #1 Hailey	2218	14S-15E-3	Kilroy, #A-1 Herring
2173	13S-16E-5	Kilroy, #1 Goebel	2219	14S-15E-5	Pend Oreille, #2 Pawlik
149	13S-16E-7	Continental, #1 McKinney	2220	14S-15E-8	Atl. Refining, #8 Lyne
151	13S-16E-7	Natl. Expl., #1 McKinney	2222	14S-15E-6	Mosbacher, #1 Kendall
2174	13S-16E-7	Jones et al, #1 Dunn	2224	14S-16E-2	Deguire et al, #1 Pugh
2175	13S-16E-8	S. Minerals, #1 Burnett	2225	14S-16E-4	McMoran, #1 Perkins
2176	13S-16E-2	Serv Contr., #1 Goebel	2226	14S-16E-3	Continental, #6 Goodwin-A
2177	13S-16E-1	Tidewater, #1Karon-Slick	2227	14S-16E-4	Sanchez, #1 George W.
148	13S-16E-7	TX Oil&Gas, #1-A Dunn	183	14S-16E-7	Atl. Refining, #1 Baker
134	13S-16E-9	W.Natural, #1 Harris	182	14S-16E-8	Atl. Refining, #1 Riser

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
2228	14S-16E-8	Atl. Refining, #5 Baker	2289	14S-26E	Continental, #62 Charles
2229	14S-16E-5	Centura, #1 Worthington	2290	14S-26E	Continental, #61 Charles
2234	14S-17E-2	Billings, #1 Nester	2291	15S-25E-1	W.Natural, #19 Charles
2235	14S-17E-5	Hankamer Inv.,#1 Hailey	2292	15S-25E-2	Continental, #38 Charles
2236	14S-17E-9	Exeter, #2 Pugh	2293	15S-25E	Continental, #32 Charles
2240	14S-24E-5	Pan Am, #1 Tatton	2294	16S-5E-9	Universal Pet, #1 Dunbar
2241	14S-24E-6	Pennzoil, #D-1 Tatton	713	16S-6E-6	Royal, #1 DeLlano
2243	15S-7E-1	Ada Oil, #1 Martin	2296	16S-6E-8	Mayfair, #1 Martin
2244	15S-8E-4	Hughes, #1 Koehne	2297	16S-16E-1	Rutherford, #1 Triple Bar
708	15S-8E-8	Flamingo, #1 Coquat	2298	16S-7E-6	Mokeen, #2 Miller
384	15S-12E-7	TX Co., #1 Atkinson	2299	16S-7E-9	Flournoy, #2 DeLlano
2245	15S-13E-7	Blair et al, #1 Rhode	2300	16S-11E-4	Gorman, #1 Whitecotton
2246	15S-13E-5	Olson, #1 Whitfield	2301	16S-12E	Humble, #2 7-Sisters-1
195	15S-13E-6	Peet et al, #1 Rhode	393	16S-12E	Atl. Richfield, #44 Foster
191	15S-13E-9	Appell et al, #1 Atkinson	2302	16S-13E-1	Argo, #2 Baker est.
2247	15S-13E-7	TX Co., #1 Rhode	2303	16S-13E-2	Argo, #K-2 Edrington
2249	15S-14E-1	Skinner, #1 Lowrance	2304	16S-13E-1	Sunray, #1 Penn
2250	15S-14E-4	Atl. Refining,#2-XRhode	2305	16S-13E	Sunray, #1 Rhodes
196	15S-14E-6	Atl. Richfield, #1ElPaso	735	16S-13E-7	Siegfried, #1 Flory
2252	15S-14E-2	Texam et al, #2 Sanger	2307	16S-13E-6	TX Co., #2 Gouger-3
199	15S-14E-2	Hurt et al, #1 Riser	2308	16S-13E-3	Argo, #1 Roos
2253	15S-14E-1	Bright, #2 Reagon	2309	16S-13E-3	Argo, #1 Bain
2255	15S-14E-8	Cox, #1 El Paso Nt.Gas	2310	16S-13E-2	Argo, #Q-1 Edrington
2256	15S-14E-6	Davis, #1 Sanger Heirs	2311	16S-13E-2	Argo, #1 Oliver
2257	15S-14E-1	Davis, #1 Lyne et al	739	16S-13E-6	Sunray, #1 Am.Ntl.Ins.
2258	15S-14E-7	Rutherford, #B-1 Baker	2312	16S-14E-4	Argo, #2 deArman
2259	15S-14E-9	Rutherford, #A-4 Baker	746	16S-14E-3	Atl. Rich., #1 Glasscock
204	15S-14E-8	Rutherford, #2-A Baker	2313	16S-14E-4	Sunray, #1 Eubanks
227	15S-15E-9	Katz, #C-1 Slick Oil	2315	16S-15E-6	Lockhart, #1 Hatch
2261	15S-15E-4	Katz, #B-1 Slick Oil	2317	16S-15E-2	Sanchez-OBrien,#1Jones
2262	15S-15E-4	Katz, #A-1 Slick Oil	2318	16S-15E-1	Tenneco, #1 Patteson
2266	15S-15E-3	Standard, #1 Lyne	2319	16S-15E-1	Harper, #1 Weston
2267	15S-15E-3	Midwest Oil, #1 Lyne	2320	16S-15E-1	Waters, #3 Reynolds
211	15S-15E-5	Standard, #1 Burns	2322	16S-15E-3	Hamon, #1 Hefner
214	15S-15E-8	Placid, #1 Patteson	2323	16S-15E-7	Fischer, #1 Freeborn
215	15S-15E-8	Tenneco, #1 Jones	2324	16S-16E-4	Tidewater, #20 Shaeffer
218	15S-15E-9	Cities Serv,#B-1Hendrick	2325	16S-16E-1	TX Oil&Gas, #1 Hinnant
217	15S-15E-2	Atl. Refining, #1 Burns	2326	16S-16E-9	Thomas Bros., #1 Donlan
222	15S-15E-2	McMoran, #1 Burns	2327	16S-16E-4	Doran, #1 Freeborn
2270	15S-15E-4	Gulf, #2 Lyne	2328	16S-16E-4	Humble, #31 Reynolds
2272	15S-15E-4	Gulf, #3 Lyne	328	16S-17E-9	Pray, #3 Banker
223	15S-15E-9	Hamill, #1 McClure	2330	16S-20E-4	Chiles, #1 Kolb
225	15S-15E-3	Austral, #1 Lyne	2331	16S-20E-5	Delhi-Taylor,#1Hughes
235	15S-16E-8	Austral, #A-1 Hinnant	2332	16S-20E-7	Kirkwood, #1 Brown
2273	15S-16E-7	Austral, #4 Jackson	2334	16S-20E-5	Hamon, #1 Heath
2274	15S-16E-5	McGarr, #C-6 McNeill	2335	16S-20E-7	Transcont'l, #2 Ewing
2276	15S-16E-9	Forney, #1 Horton	2336	16S-20E-8	Haring et al, #1 McLane
2277	15S-16E-5	Winn, #2 McNeill	329	16S-20E-8	Morgan, #3 Dodson
2278	15S-16E-8	Rhodes, #A-1 Hinnant	2338	16S-21E-7	Engeo, #B-3 Mayo
2279	15S-16E-7	Atl. Refining, #1 Parker	2339	16S-21E-5	Superior, #61 Welder
2281	15S-21E-7	Marathon, #E-20 Welder	2341	16S-22E-9	Engeo, #B-2 Mayo
2283	15S-22E-6	Taggart, #1 Fricke	2342	16S-22E-4	Melba, #1 Mayo
2284	15S-22E-7	Cox, #1 Dammann	2343	16S-22E-9	Melba, #2-B Garcia
336	15S-23E-8	Sunray, #1 Hartman	2345	16S-22E-9	Warren, #1 Stiba
2286	15S-25E-5	Prairie, #1 St Tr 374	2346	16S-22E-8	Esunas, #1 Bartels
2288	15S-25E	Continental, #39 Charles	2347	16S-22E-8	TX Co., #1 Becker

Well #	Tobin No.	Well Name
2348	16S-22E-7	Mobil, #1 Bren
343	16S-22E-7	Cities Prod., #1 Elzner
347	16S-22E-1	LaGloria, #A-1 Welder
348	16S-22E-6	Hurt, #1 Ritchie
2350	16S-22E	Stanolind, #1 Welder
2351	16S-22E-4	Tex-Penn, #7 Dimmick
350	16S-23E-7	Hamon, #1 Bankers Mort.
2353	16S-23E-5	Hunt, #3 Bankers Mort.
2354	16S-24E-3	Al Co., #1 St Tr 101
2356	16S-24E-6	Diversa, #3 St Tr 123
2357	16S-24E-6	Humble, #1 Aransas 145
2358	16S-24E-7	Humble, #1 Aransas 167
2359	16S-24E-2	Phillips, #58 Copano
361	16S-24E-8	Hamon, #1 St Tr 191
665	16S-25E-3	Sunray, #1 St Tr 96
2360	16S-25E-3	Getty, #1 St Tr 117
2361	16S-25E-3	Coastal St, #1 St Tr 78
2362	17S-5E-3	Mesa, #1 Owen
2363	17S-5E-8	AM&R, #1 Sanchez
2364	17S-5E-3	Coastal St, #1 Owens
2365	17S-6E-5	Prudhoe, #1 Chilton
397	17S-7E-8	Mobil, #5 Callaghan
2366	17S-9E-6	Appell, #1 Adami
2367	17S-11E-9	Mobil, #9 DCRC
412	17S-11E-9	Magnolia, #9 DCRC-79
2375	17S-12E-9	Fair, #1 Luptack
2377	17S-12E	Bridwell, #1 Marshall
2378	17S-13E-5	Stanolind, #D-1 Farmers
2379	17S-13E-3	ElPaso Gas, #1 Yates
2381	17S-14E-2	Tex-Star, #1 Garcia
2382	17S-14E-4	Winn, #2 Salinas
2383	17S-14E-7	Heep, #1 Garcia
2384	17S-14E	Sun, #3 Fitzsimmons
2385	17S-14E	Hawley, #2 Garcia
2386	17S-14E-6	SaltDomeProd, #1 Lopez
2387	17S-14E-6	Argo, #1 Lopez
2388	17S-15E-4	Camoen, #1 Shaeffer
451	17S-15E-7	Kidd, #1 Trejo
2389	17S-15E-1	Getty, #L-4 Shaeffer
2390	17S-19E-5	Skelly, #1 Smith
2391	17S-19E-9	N.Pump, #1 Ocker
458	17S-20E-4	Union-CA, #1 Parker
2392	17S-20E-1	S.Minerals, #1 Gillespie
2393	17S-20E-2	Coastal St, #1 Luling
462	17S-20E-8	S.Minerals, #1 Griffith
2394	17S-20E-3	Clark Drlg, #1 Corner
459	17S-20E-7	Hamon, #B-1 Odem
2395	17S-20E-6	Spartan, #1 Granberry
456	17S-20E-7	Sinclair, #1 Doney
2396	17S-20E-7	Sinclair, #1 St Tr 52976
631	17S-21E-5	Phillips, #1 Flinn
2398	17S-21E-7	Marine, #1 Grimshaw
2399	17S-21E-4	Turnbull, #1 Ewing
2400	17S-21E-7	Mobil, #1 Mayo-Owen
2401	17S-21E-3	Tomco, #1 Guaranty
2402	17S-21E-3	Coastal St, #1 Hart

Well #	Tobin No.	Well Name
2403	17S-21E-7	Mobil, #1 Jones et al
2404	17S-21E-7	Mobil, #2 Mayo-Owens
2405	17S-21E-7	Mobil, #2 Jones et al
2406	17S-21E-9	Sinclair, #1 Hunter
2407	17S-21E-9	Sinclair, #1 McLaughlin
2408	17S-21E-7	Hada et al, #1 Gierke
2409	17S-21E-6	Woodfin&Orion, #1 Vernor
2411	17S-21E-2	May et al, #1 McCann
2412	17S-21E-6	Aztec, #1 Texoil-Moore
2413	17S-21E-6	Hamon, #1 Phillips
2415	17S-21E-8	Marathon, #1 Brooks
635	17S-21E-8	Marathon, #2 Kellogg
2417	17S-22E-1	Hamon, #2 McKamey
2418	17S-22E-8	Cox, #C-4-A Portland
2419	17S-22E-8	Cox, #C-2 Portland
2420	17S-22E-8	Cox , #B-4 Portland
2421	17S-22E-9	Cox, #1 Stark
2422	17S-22E-9	Cox, #1 Barnes
2423	17S-22E-9	Cox, #2 Marriott
2425	17S-22E-8	Cox, #C-1 Portland
2428	17S-22E-8	TX Crude, #2 Garrett
2431	17S-22E-9	Galaxy, #A-3 Simons
2432	17S-22E-5	Ark. Oil, #1 McKamey
2433	17S-22E	TX Oil&Gas, #B-2 Ray
2434	17S-22E-9	Republic, #1 Lang
2435	17S-22E-4	Republic, #1 Phillips
2436	17S-22E-8	TX Crude, #3 Garrett
2437	17S-22E	Dow Chemical, #1 Toland
2440	17S-22E-8	Royal Oil, #B-3 Green
2442	17S-22E-7	Lone Star, #1 Hester
2444	17S-22E-8	Lawser, #2 McKamey
2445	17S-22E-6	Tidewater, #A-1 McKamey
2447	17S-22E-9	Royal Oil, #1 Baines
2448	17S-22E-9	Galaxy, #A-2 Simons
2449	17S-22E-3	Royal Oil, #1 Schmidt
2450	17S-22E-1	TX Oil&Gas, #A-1Ray-B
2451	17S-22E-2	Harkins et al, #1 Patrick
2452	17S-22E-1	LaGloria, #6 Harvey
2453	17S-22E-6	Trice, #1 Moore
2454	17S-22E-5	Hewitt, #2 Hunt
2455	17S-22E-5	Wainoco, #1 Taylor
2458	17S-22E-5	Cities Serv, #E-2 Taylor
2459	17S-22E-2	Cities Serv, #B-4 McKam.
2461	17S-22E-5	Cities ..., #B-2 McKamey
2463	17S-22E	Hamon, #1 McKamey
2464	17S-22E-1	Hamon, #4 Harvey
2466	17S-22E-9	Galaxy, #1 Wilson
2467	17S-23E	Midwest Oil, #1 Miller
2468	17S-22E-4	Wheelock, #1 Floerke
2470	17S-22E-9	Royal Oil, #1 Moore
2471	17S-23E-2	Conroe, #1 Chandler
2472	17S-23E-5	Tenneco, #A-4 Maryland
2473	17S-23E-1	Flournoy, #1 McCampbell
2474	17S-23E-4	Ohio Oil, #1 Davis
2475	17S-23E-9	Conroe, #1 Wheeler
2476	17S-23E-9	Conroe, #A-1 Sein

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
2477	17S-24E-2	Midwest, #1 St Tr 218	2538	19S-10E-8	Harrell, #1 Lopez
2478	17S-24E	Getty, #1 St Tr 197	2541	19S-12E-6	Taylor Refg., #1 Luby
2479	17S-24E-9	Shell, #1 St Tr 277	487	19S-15E-1	Delta Gulf, #1 Kalinec
2480	17S-24E-3	Halboughty, #1 Hepworth	2543	19S-15E-7	Associated, #1 Fitz
2481	17S-24E-9	Mobil, #1 Aransas 2	2545	19S-18E-9	Hawley, #2 Stelzig
2482	17S-24E-5	Wessely, #1 St Tr 258	2546	19S-18E-2	Puenticitas, #B-60Perry
400	18S-5E-8	Hunt, #1 Benavides	2549	19S-18E-9	Coastal St, #1 Treybig
401	18S-5E-3	Hunt, #1 Hachar	2550	19S-18E-9	Hawley, #2 Stanzell
2483	18S-16E-9	Norris, #1 Benavides	2551	19S-18E-9	Hawley, #1 Stanzell
2484	18S-7E-3	Mobil, #14 Callaghan	2552	19S-18E-4	Union , #A-7Driscoll
404	18S-7E-7	Gulf, #1 Hirsch	2554	19S-18E-2	TX Oil&Gas, #1 Schulze
405	18S-7E-6	Sunray, #1 Lincoln	2555	19S-19E-3	Moore, #3 Wright
2485	18S-7E-9	Mobil, #8 Callaghan	2556	19S-19E-3	Armstrong, #1 Hutto
420	18S-9E-7	TX Co., #B-1 Moos	2557	19S-19E-1	Paraffine, #1 Hartman
2486	18S-11E-7	Flournoy, #1 Cuellar	2558	19S-20E-2	Thomas, #1 Hellman
2488	18S-10E-9	Rowe, #J-1 Moos	2559	19S-20E-1	Shell, #1 Bevly
2491	18S-11E-3	Kirkwood, #1 DCRC	2560	19S-20E-5	Newman, #1 Walton
2494	18S-12E-1	Morrison, #1 Murphey	2562	19S-20E-7	Mobil, #5 Lehman
2495	18S-12E-9	Katz, #1 Sutherland	2563	19S-20E-3	Shield&Chap.,#1Moting
2498	18S-14E-3	Continental, #7 Mew	2564	19S-20E-1	Huffington, #1 Caldwell
2500	18S-15E-3	Miller&Fox, #6 Garcia	2565	19S-20E-5	Lone Star, #1 Howington
2501	18S-15E	Taggart, #1 Hawkins	2566	19S-20E-5	Lone Star, #A-1 Smith
2502	18S-15E-2	Penrose, #1 Martinez	2567	19S-20E-7	Morgan, #1 Connolly
454	18S-15E-6	Howell, #1 Moos	2568	19S-20E-2	Morgan, #4 Gallagher
2504	18S-18E-6	Mosser&Fischer,3McNair	2569	19S-20E-7	Morgan, #40-2 Chapman
2505	18S-18E-6	Mosser ..., #2 McNair	2570	19S-20E-1	Midwest Oil, #1 Head
2506	18S-18E-6	Salem Oil, #1 McElroy	2571	19S-20E-5	Am.Petro., #1 Walton
2507	18S-18E-6	Forest, #1 Burnett	2572	19S-20E-9	Morgan, #2 Callaway
2508	18S-18E-6	Gillring, #1 Mansheim	2574	19S-20E-1	Phillips, #B-1 Morgan
2509	18S-18E-5	Gillring, #8 Winfield	2575	19S-20E-6	Topp, #1 Ratliff
2510	18S-18E-6	Melba, #2 McNair	2579	19S-20E-7	Socony, #B-1 Chapman
2511	18S-18E-6	Melba, #3 McNair	2580	19S-20E-7	Socony, #1 Lehman
2512	18S-18E-2	Haring, #A-1 Cheeves	2581	19S-20E-7	Texaco, #31 Chapman
2513	18S-19E-8	Singleton, #2 Wright	2582	19S-20E-2	May, #2 Merritt
2514	18S-19E-4	Hunt&Hamon, #1 Stone	2584	19S-20E-1	Republic, #A-3 Bevly
2515	18S-19E-9	Spartan et al, #1 Wisian	2585	19S-20E-2	Gilley, #1 Merritt
2516	18S-19E-9	Spartan, #1 Thomas	2587	19S-20E-7	Mobil, #2 Lehman
2517	18S-19E-9	McBride, #1 Thomas	2588	19S-20E-7	Mobil, #B-6 Chapman
2518	18S-19E-3	Austral, #1 Walton	2589	19S-20E-7	Mobil, #2 Garrett
2519	18S-19E-9	Luling O&G, #1 Shivers	2591	19S-21E-8	LaGloria, #1 Arnim
2520	18S-20E-8	Morgan Min., #A-4 Cody	2592	19S-21E-7	Engelke, #1 Gwynn
2522	18S-20E-2	Tenneco, #C-4 Kenedy	2596	19S-21E-9	Mobil, #1 Crook
2523	18S-20E-7	Republic , #B-2 Bevly	2598	19S-21E-9	Mobil, #B-4 Chapman
471	18S-20E-2	Gulf, #1 McGregor	2600	19S-21E-4	Morgan, #1 Cooke
2524	18S-20E-5	Dugger&Herr., #1Morgan	2601	19S-21E-3	Hamon, #1 Peterson
2526	18S-20E-7	Renwar, #1 Scoggins	2602	19S-21E-8	Jocelyn, #1 Garrett
2527	18S-20E-7	Superior, #1 Kelly	2603	19S-21E-2	Hamon, #1 Pernitas
2529	18S-20E-6	S.Minerals, #A-1 Cole	2604	19S-21E-3	Harkins, #1 Woodman
2532	18S-20E-4	Hanover, #1 Head	2605	19S-21E-3	Sinclair, #1 CorpusChr.
2533	19S-5E-6	Intl.Nuc.,#1Killam-Hurd	2606	19S-21E-5	PanAm Pet., #1 U.S.A.
434	19S-5E-9	Gen.Crude, #1Killam...	2607	19S-22E-9	Driscoll, #1 Smith
2534	19S-9E-3	Chapman, #1 Hughes	2608	19S-22E-4	Humphrey, #1 Benys
2535	19S-10E-2	Mayfair, #1 Kirkpatrick	2609	19S-22E-2	Marathon, #1 Silcock
2536	19S-10E-6	Parker&Hillier,#1Peters	2610	19S-22E-9	Montego, #1 Bishop
474	19S-10E-4	Houston Oil, #1 Billings	2611	20S-6E-5	Ginther, #C-1 Killam
2537	19S-10E-9	Atl.Refg., #A-1 Billings	2612	20S-6E-1	Brewster, #1 Killam

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
2614	20S-10E-5	Hamon, #1 Perez	519	22S-6E-1	Moore, #G-1 Hubbard
2621	20S-20E-2	Morgan, #43-1 Chapman	2684	22S-6E-4	Gulf, #1 Bruni
2623	20S-20E-1	Morgan..., #73-1 Chap.	2685	22S-7E	Gulf, #A-3 BMT
2624	20S-20E-2	Morgan, #43-2 Chapman	2687	22S-7E-3	Gulf, #A-1 BMT
2625	20S-20E-6	Morgan, #1 Chapman	2688	22S-7E-6	Sun, #1 TX Calgary
2629	20S-21E-6	Exxon, #G-35 King Rch.	527	22S-7E-2	Good Hope, #1 Saldivar
2630	20S-21E-3	Morgan, #C-1 Chapman	2689	22S-8E-8	Shell, #1 Bruni&Killam
2631	20S-22E	McMoran, #2 St Tr 171	2691	22S-8E-3	Coastal St, #1 Martin
2632	20S-22E-9	Exxon, #B-10 King Rch.	2692	22S-8E-7	Superior, #1 McGrath
2633	20S-22E-9	Exxon, #B-12 King Rch.	2693	22S-9E-8	Gulf, #1 Fulbright
2634	20S-22E-9	Exxon, #B-11 King Rch.	2694	22S-9E-7	Atl.Rich., #2 Bruni-1
2635	20S-22E-1	Centura, #1 St Tr 46	2695	22S-9E-4	Pennzoil, #72-1 Bruni
2636	20S-22E-8	Carrl, #1 St Tr 182	2696	22S-9E-7	Atl.Rich., #A-3 McLean
2637	20S-22E-8	Carrl, #1 St Tr 167	540	22S-9E-3	Atl.Refng., #1 Puig
2638	20S-22E-7	Sun, #B-6 Dunn...	2697	22S-9E-3	Atl.Refng., #A-2 Puig
507	21S-5E	Gulf, #A-2 Martin	541	22S-9E	Pickens, #1 Bruni
2639	21S-6E-7	Richardson, #1McKend.	2699	22S-9E-4	Atl.Refng., #A-1 Puig
509	21S-7E-9	Gulf, #A-10 BMT	2701	22S-16E	Sun, #10 Sullivan
2641	21S-7E-6	Anderson, #2 Martin	2702	22S-16E-2	Sun, #35 Canales
512	21S-7E	N.Natural, #1 BMT	2703	22S-16E-5	Sun, #16 Canales
2643	21S-7E-9	Gulf, #A-13 BMT	2704	22S-16E	Sun, #9 Canales
513	21S-8E-9	TX Eastern, #1 Bruni	2705	22S-16E	Sun, #10 Canales
2644	21S-8E-9	TX Eastern, #2 Bruni	2706	22S-16E-8	Sun, #43 Canales
2645	21S-8E-7	Texaco, #28 Camara	2707	22S-16E-5	Sun, #47 Canales
2646	21S-8E-5	Skelly, #2 Walker-C	2708	22S-16E-2	Sun, #31 Canales
2648	21S-9E-6	Denison-Texcan,#1BMT	556	22S-16E-4	Mobil, #B-3 Blucher
2649	21S-9E-5	Amistad, #A-1 White	2709	22S-16E-4	LaGloria, #39 Blucher
2650	21S-10E-5	Blair-Vreeland, #1 Benav.	2710	22S-16E-3	Texaco, #75 Tijerina
2653	21S-14E-3	Weaver&...,#2 Marshall	2711	22S-17E-7	Humble, #8 King Rch.
2654	21S-14E-2	Morgan, #10 Moos	2714	22S-18E-6	McDermott, #1 Baldesch.
2655	21S-17E	Forest, #3 Wernecke	2715	22S-18E-6	Harkins, #1 Yaklin
2656	21S-17E	Forest, #4 Wernecke	584	22S-18E-1	Hill, #1 Brookshire
2658	21S-17E	Forest, #1 Wernecke	2716	22S-18E-1	Morgan, #1 Hubert
2660	21S-17E	Forest, #3 Wernecke	2717	22S-18E-6	Cities Serv., #1 May-B
2661	21S-17E	Forest, #2 Wernecke	2718	22S-18E-1	Mokeen, #A-1 Hubert
561	21S-17E-1	S.Minerals, #1 Wernecke	2719	22S-18E-7	Cities Serv., #1 Koch-B
2662	21S-17E-6	Meeker, #1 Otto	2720	22S-17E-7	Exxon, #37 Canelo
568	21S-18E-5	Sun, #1 Dietz	2721	22S-18E-7	Ark.Fuel, #1 Meyer-Poteet
2663	21S-18E-6	Humble, #P-2 King Rch.	583	22S-18E-7	Ark.Fuel, #1 Womack
2664	21S-19E-1	Humble, #202 King Rch.	2723	22S-18E-6	Ark.Fuel, #C-1 Kaufer
2665	21S-19E-6	Humble, #150 King Rch.	2724	22S-19E-4	Ark.Fuel, #1 Russell
2666	21S-19E6	Humble, #177 King Rch.	2727	22S-19E-4	Ark. Fuel, #1 Mittag
2668	21S-19E-7	Humble, #1 King Rch.	2728	22S-19E-4	Ark.Fuel, #1 Orr
2669	21S-19E-7	Humble, #8 King Rch.	2729	22S-19E-3	Ark.Fuel, #1 Schonefeld
2670	21S-19E-9	Humble, #1 Heep Field	2730	22S-19E-3	Cities Serv., #B-1 Huff
2671	21S-19E-8	Humble, #10 Visnaga	2731	22S-19E-4	Cities Serv., #C-1 May
2672	21S-19E-1	Exxon, #16 King Rch.	2732	22S-19E-4	Ark.Fuel, #A-1 Hubert
2673	21S-19E-5	Humble, #9 King Rch.	2733	22S-19E-9	Exxon, #137 Sarita O&G
577	21S-20E-5	Humble, #245 King Rch.	2734	22S-19E-5	Cosden Pet., #2 Hubert
2676	21S-20E-3	Exxon, #306 King Rch.	2736	22S-19E	Sun&Morgan, #1 Fimble
2677	21S-20E-2	Humble, #130 King Rch.	2737	22S-19E-9	Exxon, #140 Sarita O&G
2678	21S-20E-8	Humble, #96 King Rch.	2738	22S-19E-5	Gulf, #1 Dietz
2679	21S-20E-5	Humble, #155 King Rch.	2739	22S-19E-5	Davis, #1 Koch-2
2681	21S-21E-6	Humble, #3 King Rch.	2740	22S-19E-9	Humble, #123 Sarita O&G
2683	22S-5E-7	Estes, #1 Martinez	592	22S-19E-8	Humble, #B-25 East
516	22S-5E-4	TX O&G, #2 Zachry			

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
766	23S-6E-5	Continental, #2 Gutierrez	831	23S-17E	TX O&G, #3 Erck
767	23S-6E-8	Gulf, #1 Garza et al	832	23S-17E-5	TX O&G, #11 Erck
768	23S-6E-8	Gulf, #1 Uribe	833	23S-17E-6	Gulf, #1 McGill
769	24S-6E-1	Gulf, #3 Martinez	834	23S-17E-6	Gen.Crude, #1 Crocker
770	23S-6E-1	Jackson, #1-A BMT	835	23S-17E-7	Gen.Crude, #1 Scott...
771	23S-6E-1	Good Hope, #5 McAskill	836	23S-17E	Sunray, #1 Scott-McGill
772	23S-6E-4	Gas Prod., #10A Mecom	837	23S-18E-6	Humble, #11-E Kenedy
773	23S-6E-7	Continental, #1 Carreon	838	23S-18E-7	Humble, #3-E Kenedy
774	23S-6E-7	Continental, #1 Rathmell	840	23S-18E-9	Humble, #5-E Kenedy
775	23S-6E-7	O-Tex Ener., #3 Benavides	841	23S-18E-2	Humble, #1 McGill
776	23S-6E-2	Sun, #1 Amberson-Bent.	842	23S-18E-1	Humble, #128 Sarita
777	23S-6E-7	Becker, #2 Sanchez Est.	843	23S-18E-1	Humble, #46 Sarita
780	23S-7E-4	Hawkins, #2 Sanchez	844	23S-18E	Humble, #3 S. May
781	23S-7E-8	Good Hope, #1 Jennings	845	23S-18E-8	Humble, #2-H Kenedy
782	23S-8E-5	Belco, #1 Frost Bank	846	23S-18E-8	Humble, #1-H Kenedy
783	23S-8E-7	Union, #1 de Cuellar	847	23S-18E-9	Ark. Fuel, #5 McGill
784	23S-8E-1	Atlantic, #1 Hinnant	848	23S-18E-4	Ark. Fuel, #1 McGill
785	23S-8E-8	Hughes, #1 Martinez	849	23S-18E-8	Ark. Fuel, #2 McGill
786	23S-8E	Hughes, #2 Martinez	850	23S-18E-8	Ark. Fuel, #3 McGill
787	23S-8E-8	Hughes, B-1 Cuellar	853	23S-18E-7	Exxon, #28-E Kenedy
788	23S-8E-7	Atlantic, #1 Cuellar	854	23S-19E	Exxon, #142 Sarita
790	23S-8E-2	Killam&Hurd, #1 Flbrght.	855	23S-19E-4	Exxon, #B-27 East
791	23S-8E-1	Killam&Hurd, #1 Uribe	856	23S-19E-2	Humble, #B-10 East
792	23S-8E-5	Hughes, #A1 Uribe	857	23S-19E	Exxon, #B-30 East
793	23S-8E-6	Hughes, #1 Fullbright	859	23S-19E	Humble, #B-18 East
794	23S-9E-1	Atl.Rich., #A3 Mclean	862	23S-19E-8	Humble, #7-J Kenedy
795		Blocker, #1-252 Hinnant	863	23S-19E-2	Humble, #B-14 East
796	23S-10E-4	Marston, #1 Martinez	865	23S-19E-3	Humble, # B-5 East
797	23S-9E-3	Atl.Refng., #1-B Hinnant	866	23S-19E-8	Humble, #J-14 Kenedy
798	23S-9E-2	Standard, #2 Holbein	867	23S-19E-3	Humble, #E-7 Kenedy
799	23S-9E-6	Hamon, #2 Perez	868	23S-19E-8	Humble, #J-5 Kenedy
800	23S-9E-2	Hamon, #2 Holbein	869	23S-19E-9	Humble, #E-17 Kenedy
801	23S-9E	Hamon, #1 Holbein	870	23S-19E-9	Humble, #E-16 Kenedy
802	23S-9E	Austral, #5 Mclean	872	23S-19E-9	Humble, #E-13 Kenedy
803	23S-9E-4	Blocker, #1-252 Hinnant	873	23S-19E-3	Humble, #97 Sarita
805	23S-10E-3	Marston, #3 Martinez	874	23S-19E-3	Humble, #98 Sarita
806	23S-10E-5	Rowe, #1 Martinez	875	23S-19E-8	Humble, #1 Risken
807	23S-11E-9	Morris, #1 Mest.-Saenz	876	23S-19E	Humble, #B-13 East
808	23S-11E-6	Main, #1 McCampbell	877	23S-19E-8	Humble, #J-3 Kenedy
809	23S-11E-2	N. Pump, #1 Silver Lake	879	23S-19E-9	Humble, #J-1 Kenedy
810	23S-12E-8	Brown, #1 Yaeger	880	23S-19E-9	Humble, #E-9 Kenedy
811	23S-13E-2	Forest, #2 SW TX Oil	882	23S-19E-4	Exxon, #E-31 Kenedy
814	23S-14E-4	Bennett, #17 Fee	883	23S-19E	Humble, #B-20 East
816	23S-15E-9	Am.Petro., #1 Cage	884	23S-19E-3	Exxon, #135 Sarita
817	23S-16E-3	Gen. Crude, #1 Garza	885	23S-19E-9	Humble, #E-12 Kenedy
818	23S-16E-4	Ginther, #1 Miller	886	23S-19E-2	Humble, #B-17 East
819	23S-16E-1	Anschutz, #1 Rupp	887	23S-19E-8	Humble, #2 Risken
820	23S-16E	Sun, #1 Rupp	888	23S-19E	Humble, #J-2 Kenedy
821	23S-16E	Crown Cent., #1 Cosby	889	23S-19E-3	Humble, #122 Sarita
822	23S-17E-1	Davis, #1 Crocker	890	23S-19E-9	Exxon, #E-30 Kenedy
823	23S-17E-2	Hill&Wagner, #3 McGill	891	23S-19E-9	Exxon, #E-26 Kenedy
824	23S-17E-6	Gulf, #3 McGill	892	23S-19E-8	Exxon, #3 Risken
825	23S-17E-1	Gulf, #2 McGill	893	23S-19E-8	Exxon, #4 Risken
826	23S-17E-6	Gulf, #1 McGill	896	23S-21E-5	Samedan, #1 St Tr230
828	23S-17E	TX O&G, #9 Erck	897	23S-21E-6	Sun, #9 Dunn-McCamp.
829	23S-17E	TX O&G, #16 Erck	898	24S-5E-1	Gulf, #1 Sanchez

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
899	24S-5E-7	Sanchez-..., #1 S.Fern	962	24S-11E-7	Sun, #36 Weil Bros.
901	24S-5E-1	Gas Prod., #6 Mecom	963	24S-12E-5	Shell, #4 Mestena
902	24S-5E-6	Mobil, #2 Zachry	964	24S-12E-1	Shell, #1 Mestena
904	24S-6E-7	Amer.Pet., #1 Bartlett	965	24S-12E-7	Shell, #7 Mestena
905	24S-6E-2	Gulf, #1 Martinez	966	24S-12E-8	Ayres, #4 Mestena
906	24S-6E-1	R. Maguire, #1 Trevino	967	24S-13E-2	Maguire, #1 Saunders
907	24S-6E-9	Miller, #1 Ramirez	968	24S-14E-7	Humble, #2 Hopper
908	24S-6E-2	Gulf, #4 Uribe	969	24S-14E-6	Nor-Mac..., #1 Cage
909	24S-6E-3	Mobil, #1 Zachry	970	24S-15E-5	Forest, #1 Rachal
910	24S-6E-3	Mobil, #4 Zachry	971	24S-16E-3	Carr, #1 Cage
911	24S-6E-6	Gulf, #1 Ramirez	974	24S-15E-1	Forest, #1 Cage
912	24S-6E-6	CPC, #1 FGG Ranches	976	24S-17E-7	Exxon, #63 East
913	24S-6E-4	CO O&G, #1 Gutierrez	979	24S-17E-4	Humble, #16-B Sullivan
914	24S-6E-2	Gulf, #7 Uribe	981	24S-17E-7	Humble, #12 East
915	24S-6E-2	Gulf, #1 Martinez	982	24S-17E	Humble, #27 East
916	24S-6E-5	Gulf, #1 Ramirez	983	24S-17E-3	Humble, #7 East
917	24S-6E-3	Gulf, #4 Vergara	984	24S-18E	Humble, #39 East
918	24S-6E-2	Gulf, #6 Uribe	986	24S-18E-8	Humble, #54 East
919	24S-6E-2	Gulf, #2 Martinez	987	24S-18E-9	Humble, #38 East
920	24S-6E-1	Gulf, #1 Rangel	988	24S-18E-9	Humble, #32 East
921	24S-6E-2	Gulf, #2 Martinez	989	24S-18E-9	Humble, #43 East
922	24S-6E-2	Gulf, #2 Rangel	990	24S-18E-2	Ark. Fuel, #4 McGill
923	24S-6E-2	Gulf, #2 Uribe	992	24S-18E-1	Exxon, #C-11 Kenedy
924	24S-6E-2	Gulf, #1 Vergara	993	24S-18E	Exxon, #C-14 Kenedy
925	24S-6E-2	Gulf, #1 Uribe	994	24S-18E-2	Exxon, #C-13 Kenedy
926	24S-6E-6	Good Hope, #1 Guti.	995	24S-18E-2	Exxon, #C-9 Kenedy
927	24S-6E-3	Gulf, #9 Martin	996	24S-18E-2	Exxon, #C-10 Kenedy
928	24S-6E-3	Gulf, #8 Martin	997	24S-18E-5	Exxon, #91 East
929	24S-6E-3	Gulf, #4 Martin	998	24S-18E-9	Exxon, #85 East
930	24S-7E-3	Amer. Pet., #1 Haynes	999	24S-18E-9	Exxon, #77 East
931	24S-7E-1	Blanco, #1 Jennings	1000	24S-18E-4	Exxon, #97 East
932	24S-7E-9	HNG Oil, #1 Alexander	1001	24S-18E-6	Exxon, #82 East
933	24S-7E-4	Solo, #2 Bartlett	1002	24S-19E-1	Ark.Fuel, #1 Kenedy
935	24S-7E-3	Skelly, #2 Vergara	1003	24S-19E-9	Exxon, #81 East
936	24S-7E-7	Houston O&M, #1 Asche	1005	24S-19E-9	Exxon, #66 East
938	24S-8E-9	Good Hope, #1 Flores	1006	24S-19E-4	Humble, #52 East
939	24S-8E-7	Halboughty, #1-CGarza	1008	24S-19E-5	Humble, #53 East
940	24S-8E-7	Halboughty, #D1 Garza	1009	24S-19E-9	Humble, #25 East
941	24S-8E-7	Halboughty, #B1 Garza	1010	24S-20E-8	Exxon, #68 East
942	24S-8E-7	Halboughty, #1 Trev.	1014	24S-21E-3	Humble, #K-1 Kenedy
943	24S-8E-7	Lively, #1 Trevino	1016	25S-6E-6	Siegfried, #1 Morales
944	24S-8E-2	Pennzoil, #32 Jennings	1018	25S-7E-9	Solo, #1 Singer
945	24S-8E-2	Pennzoil, #33 Jennings	1020	25S-7E-9	Solo, #1 I.M. Singer
947	24S-9E-3	Gulf, #201801 Garza	1021	25S-7E-5	Rowe, #1 Flores
949	24S-9E-1	Standard, #1-3 Frost	1022	25S-7E-5	McDaniel, #1 Singer
950	24S-9E-8	Standard, #1 Blanco	1023	25S-7E-8	RioGrande, #1 Dodier
951	24S-9E-3	Gulf, #1 Saurez	1024	25S-7E-5	Miles, #1 Ramirez
952	24S-9E-8	Hill&Wag., #1 Leyen.	1025	25S-7E-9	Gulf, #1 de Pena
953	24S-9E-3	Halboughty, #A1 Garza	1026	25S-7E-3	Gulf, #1 Ramirez
954	24S-9E-9	Shell, #1 Zachary	1027	25S-7E-2	Gulf, #1 Flores
955	24S-9E-6	Hughes, #1 Palacios	1028	25S-7E-4	Good Hope, #1 Swat.
956	24S-9E-3	Apache, #1 Saldana	1029	25S-7E-6	Rutter, #1 Volpe
957	24S-9E-4	Albright, #1 Hinch	1030	25S-7E-8	MacDonald, #1 Uribe
958	24S-10E-7	Gorman, #B-18 East	1032	25S-7E-6	Samedan, #1 Matles
959	24S-10E-5	Allen&Bemis, #2Gall.	1033	25S-7E-4	Coastal St., #1 Flores
961	24S-11E-2	Davidson, #1 Weil	1034	25S-7E-5	McAll, #1 Gutierrez

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
1035	25S-7E-8	Coastal St., #4 Dodier	1105	25S-18E-8	Exxon, #46 Armstrong
1036	25S-7E-8	Osage, #1 Uribe	1106	25S-18E	Exxon, #60 Armstrong
1037	25S-7E-8	Miller&Fox, #1Dodier	1107	25S-18E-6	Exxon, #30 Armstrong
1038	25S-8E-8	Crescent, #1 Haynes	1108	25S-18E-5	Exxon, #44 Armstrong
1039	25S-8E-6	Gulf, #1 Sec.Bank-LA	1109	25S-18E-4	Exxon, #58 Armstrong
1040	25S-8E-4	Pennzoil, #2 Haynes	1110	25S-18E-5	Exxon, #54 Armstrong
1042	25S-8E-5	Pennzoil, #3 Haynes	1111	25S-18E-8	Exxon, #34 Armstrong
1043	25S-8E-8	Pennzoil, #1 Vela	1112	25S-18E-3	Exxon, #93 East
1045	25S-8E-5	Humble, #1 Haynes	1113	25S-19E-7	Exxon, #67 East
1047	25S-9E-2	Cochran, #1 Garza	1114	25S-19E-7	Exxon, #69 East
1048	25S-9E-9	Miami, #1-292 Welch	1115	25S-19E-9	Humble, #1 King Rch.
1049	25S-9E-9	Miami, #1 -288 Lopez	1116	25S-20E-4	Exxon, #98 East
1050	25S-9E-4	Miami, #2 Schroeder	1117	25S-20E-7	Humble, #1 Rincon
1051	25S-9E-8	Hamon, #1 Schroeder	1119	25S-21E-4	Gulf, #1 St.Tr. 301
1052	25S-9E-9	Hamon, #1 McCampbell	1120	25S-21E-3	Humble, #C-2 East
1055	25S-11E-2	Corpus Chr., #4 Weil	1121	25S-22E-9	Union of CA, #1 Jones
1056	25S-11E-2	Burns #2, #1 East	1123	26S-7E-7	Gulf, #A-1 Gonzalez
1058	25S-13E-7	Humble, #G-5 Mestana	1125	26S-7E-8	TX Oil, #M-1 Guerra
1060	25S-14E	Standard, #1-20 Garcia	1126	26S-7E-8	TX Oil, #I-1 Guerra
1062	25S-16E	Sun, Garza	1128	26S-7E-2	Maguire, #1 Salinas...
1063	26S-15E-4	Hilliard, #A-1 Lips	1129	26S-7E-3	Allen&Shumate, #1Volpe
1064	25S-16E-5	Humble, #39 Kleberg	1130	26S-7E-7	Flournoy, #2 Benavides
1065	25S-17E-1	Exon, #64 East	1131	26S-7E-8	Hamon, #1 Alexander
1067	25S-17E-7	Exxon, #35 Armstrong	1132	26S-7E-6	Sun, #1 Vela
1068	25S-17E1	Humble, #23 East	1133	26S-8E-2	Standard, #1 Vela
1069	25S-18E-3	Exxon, #87 East	1134	25S-8E-8	Bright&Schiff, #1 Vela
1071	25S-17E-1	Humble, #47 East	1135	26S-8E-2	Pennzoil, #2 Vela 1193
1073	25S-18E-4	Humble, #11 Armstrong	1136	26S-8E-8	Jonnell Gas, #1 Zamora
1074	25S-18E-4	Humble, #12 Armstrong	1137	26S-8E-9	Frankfort, #1 Benavides
1075	25S-18E-4	Humble, #10 Armstrong	1138	26S-8E-9	Lone Star, #1 Vela
1076	25S-18E-9	Exxon, #37 Armstrong	1139	26S-8E-5	Tenneco, #1 Garcia
1077	25S-18E-9	Humble, #18 Armstrong	1140	26S-8E-3	Skelly, #1 Pfeuffer
1078	25S-18E-4	Humble, #16 Armstrong	1141	26S-8E-2	Katz, #1 Vela
1079	25S-18E	Exxon, #48 Armstrong	1142	26S-8E-3	Standard, #1 Garcia 2
1080	25S-18E-3	Exxon, #61 East	1143	26S-8E-5	Trahan Drlg., #1 Garcia
1081	25S-18E-3	Exxon, #83 East	1144	26S-8E-5	Trahan Drlg., #1 Whittier
1082	25S-18E-8	Exxon, #38 Armstrong	1145	26S-8E-8	Crescent Oil, #1 Foss
1083	25S-18E-5	Humble, #25 Armstrong	1146	26S-8E-5	Crescent Oil, #1 Morales
1084	25S-18E-4	Humble, #23 Armstrong	1147	26S-8E	Sanchez..., #1 Rottersman
1085	25S-18E-3	Exxon, #92 East	1150	26S-9E-7	Coastal Trend, #1 Munoz
1086	25S-18E-3	Exxon, #71 East	1151	26S-9E-3	Southland Rlty., #1 Garcia
1087	25S-18E-9	Exxon, #40 Armstrong	1153	26S-9E-3	Clark Fuel, #1 Jauer
1088	25S-18E-8	Exxon, #39 Armstrong	1154	26S-9E-2	Culliman, #1 Flores
1089	25S-18E-6	Humble, #9 Armstrong	1155	26S-11E-8	Arrow Petro., #1 Jones
1090	25S-18E-5	Humble, #21 Armstrong	1156	26S-11E-6	Sun, #B-4 Ramirez
1091	25S-18E-4	Humble, #14 Armstrong	1157	25S-11E-9	Sun, #A-17 East
1092	25S-18E-9	Humble, #5 Armstrong	1158	26S-14E-1	Coastal St., #1 de Luna
1093	25S-18E-1	Humble, #4 Armstrong	1159	26S-12E-8	Oil Oper., #A-1 Margo
1094	25S-18E-9	Humble, #7 Armstrong	1160	26S-14E-2	TX Co., #19 McGill
1095	25S-18E-8	Humble, #8 Armstrong	1161	26S-14E-2	Standard, #1-14 Garcia
1097	25S-18E-3	Humble, #22 East	1162	26S-15E-5	Shell, #1 Lips
1098	25S-18E-3	Humble, #21 East	1163	26S-15E-1	Shell, #1 Lopez
1099	25S-18E-1	Humble, #41 East	1165	26S-17E-3	Humble, #1 Clark
1100	25S-18E-1	Humble, #56 East	1166	26S-17E-4	Exxon, #20 Julian
1102	25S-18E-3	Exxon, #118 East	1167	26S-17E-2	Haas, #2 Clark&Sain
1104	25S-18E-3	Exxon, #75 East	1168	26S-17E	Humble, #10 Santa Fe

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
1169	25S-17E-9	Haas, #3 Clark&Sain	1236	27S-14E-7	Shell, #47 McAllen
1170	26S-17E-1	Haas, #4 Ball	1237	27S-14E-6	Shell, #50 McAllen
1171	26S-17E-3	Haas, #1 Clark State	1239	27S-14E-7	Shell, #60 McAllen
1172	26S-17E-2	Humble, #2 Clark&Sain	1240	27S-14E-6	Shell, #54 McAllen
1173	26S-17E-3	Humble, #1 Clark&Sain	1241	27S-14E-8	Shell, #56 McAllen
1174	26S-18E-3	Exxon, #36 Armstrong	1242	27S-14E-6	Shell, #55 McAllen
1175	26S-18E-2	Exxon, #52 Armstrong	1243	27S-14E-9	Hanson..., #1 Guerra
1176	26S-18E	Exxon, #31 Armstrong	1244	27S-14E-9	Inexco, #1 SW Rylty.
1177	26S-18E-3	Humble, #27 Armstrong	1246	27S-14E-8	Continental, #1 Longoria
1178	26S-18E-2	Humble, #22 Armstrong	1247	27S-14E-8	Shell, #11 McAllen
1179	26S-19E-1	Exxon, #104 East	1248	27S-14E-2	Shell, #1 McAllen
1180	26S-19E-1	Exxon, #79 East	1249	27S-14E-7	Shell, #3 McAllen
1183	27S-8E-9	Jonnell, #1 Yzaguire	1251	27S-14E-4	McWilliams, #1 Guerra
1184	27S-8E-9	Jonnell, #1 Ramos	1252	27S-14E-6	Shell, #16 McAllen
1185	27S-8E-3	Jonnell, #1 Lopez Heirs	1253	28S-14E-1	Forest, #12 McAllen
1186	27S-8E-3	Hudson, #1 Zamora	1254	27S-14E-9	Champlin, #7 Barrera
1188	27S-8E-9	Jonnell, #2 Ramirez	1255	28S-14E	Forest, #9 McAllen
1189	27S-8E-9	Jonnell, #1 Guerra	1256	28S-14E-1	Forest, #14 McAllen
1190	27S-8E-1	Jonnell, #2 Ramos	1257	28S-14E-1	Forest, #10 McAllen
1191	27S-8E-9	Jonnell, #1-A Guerra	1258	27S-14E-7	Shell, #B-12 McAllen
1192	27S-8E-4	Cosden Pet., #1 Ramirez	1259	27S-15E-9	Shell, #B-6 McAllen
1193	27S-8E-9	Jonnell, #2 Ramirez	1261	27S-15E-7	Shell, #2 Schaleben
1194	27S-8E-4	Jonnell, #2 Ramirez	1262	27S-15E-9	Sun, #3 Beaurline
1196	27S-8E-4	Delhi, #2 Ramirez	1263	27S-15E-4	TX Co., #3 McAllen
1197	27S-8E-3	Lone Star, #1 Zamora	1264	27S-15E-7	Shell, #1 Schaleben
1198	27S-8E-2	Frankfort, #2 Sanchez	1265	27S-15E-8	Shell, #1 Goldston
1199	27S-8E-3	Frankfort, #1 Garcia	1266	27S-15E-7	Shell, #3 Schaleben
1200	27S-8E-3	Frankfort, #1 Sanchez	1267	27S-15E-6	Sun, #1 Guerra
1202	27S-9E-9	Slick Oil, #1 Guerra	1268	27S-15E-9	Sun, #1 Beaurline
1203	27S-9E-4	Sun, #1 Mendosa	1269	27S-15E-7	Hanson, #1 Schaleben
1204	27S-9E-6	Clark, #6 Salinas	1272	27S-17E	Humble, #16 Kleberg
1205	27S-9E-3	Gilcrease, #1 Vasquez	1273	27S-17E	Humble, #4 Kleberg
1206	27S-12E-7	Sun, #4-A Hall	1277	27S-17E-5	Humble, #15 Kleberg
1207	27S-12E-8	Sun, #11 Coates	1278	27S-17E-5	Humble, #3 Kleberg
1208	27S-12E-9	Burns&Cox, #4 Walton	1279	27S-18E-5	Standard, #1 Garcia
1209	27S-12E-7	Clark, #2 Speer	1280	27S-19E-8	TX Co., #4 Yturria
1210	27S-13E-8	Hunt&Parker, #1 Longoria	1281	26S-20E-1	Union Prod., #1 St Tr349
1211	27S-13E-3	Sun, #C-36 Montalvo	1282	26S-29E-1	Union Prod., #1 St Tr348
1213	27S-13E-7	Champlin, #B-5 Guerra	1285	27S-20E-3	Exxon, #16 King Rch.
1217	27S-14E-5	Shell, #11 Christian	1286	27S-21E-2	Mobil, #1 St Tr 406
1218	28S-14E-3	Shell, #26 Christian	1287	27S-21E-5	Union, #1 St Tr 419
1219	27S-14E-8	Taylor Oil, #1 Woods...	1288	28S-7E-1	Hamon, #1 Yzaguirre
1220	27S-14E-9	Shell, #1 Cavazos	1289	28S-7E-1	Hamon, #1 Guerra
1221	27S-14E-8	Shell, #A-1 McAllen	1290	28S-7E-1	Homaby, #1 Garcia
1222	27S-14E-6	Shell, #B-5 McAllen	1293	28S-9E-4	Austral, #1 Santos
1223	27S-14E-7	Shell, #B-2 McAllen	1294	28S-9E-4	Superior, #1 Sanchez
1224	27S-14E-7	Shell, #B-3 McAllen	1295	28S-10E-9	Falcon, #1 Dishman
1225	27S-14E-8	Shell, #9 McAllen	1296	28S-10E-1	Forest, #4 Coates Rch.
1226	27S-14E-7	Shell, #B-1 McAllen	1297	28S-12E-1	Sun, #C-3 Hall
1227	27S-14E-7	Shell, #B-7 McAllen	1298	28S-12E-3	Sun, #A-4 Coates
1228	27S-14E-6	Shell, #43 McAllen	1299	28S-12E-6	Rowan, #1 Howell
1229	27S-14E-8	Shell, #2 McAllen	1300	28S-12E-5	Cont'l, #A-3 Cameron
1230	27S-14E-6	Shell, #46 McAllen	1301	28S-12E-4	Union, #1 Cameron
1232	27S-14E-5	Shell, #8 McAllen	1302	28S-12E-4	Cont'l, #1 Cameron-76
1233	27S-14E-7	Shell, #52 McAllen	1303	28S-12E-6	Neuhaus, #1 Alvarado
1234	27S-14E-6	Shell, #53 McAllen	1304	28S-12E-7	Neuhaus, #1 Mimmo-1

Well #	Tobin No.	Well Name
1305	28S-12E-1	Shell, #1 Thomas
1306	28S-12E-6	Shell, #3 Judd
1307	28S-12E-8	Tenneco, #E-1 Davenport
1309	28S-12E-2	Ark. Fuel, #31 Martinez
1310	28S-12E-1	Shell, #1 Howell
1311	28S-12E-6	Shell, #1 Alvarado
1312	28S-12E-6	Shell, #2 Judd
1313	28S-12E-1	Shell, #7 Garza
1314	28S-12E-8	Sunray, #B-5 Slick
1315	28S-12E-1	TX Co., #5 Martinez
1316	28S-12E-6	Delhi..., #1-B Cameron
1317	28S-12E-1	Sun, #C-1 Hall
1318	28S-12E-1	Sun, #16 Hall
1319	27S-12E-7	Sun, #A-6 Hall
1320	28S-12E-1	Sun, #18 Hall
1321	28S-12E-1	Sun, #15 Hall
1322	28S-12E-1	Sun, #19 Hall
1323	27S-12E-7	Sun, #A-5 Hall
1324	28S-12E	Sun, #13 Saenz
1325	28S-12E	Sun, #6 Hall
1326	28S-12E-2	Sun, #11 Saenz
1328	28S-12E-1	Sun, #1 Kincaid
1329	28S-12E-3	Sun, #3 Lehr
1330	28S-12E	Sun, #15 Saenz
1331	28S-12E	Sun, #20 Saenz
1334	28S-12E-2	Sun, #19 Saenz
1335	28S-12E-1	Sun, #1 Guerra
1336	28S-11E-7	Fly, #1 Lilliefelt
1337	28S-11E-7	Daubert, #1 Maresh
1338	28S-13E-2	Coastal St., #1 Howell
1340	28S-13E-5	Zoch&Turn., #1 Bentsen
1341	28S-13E-2	Coastal St., #1 Echols
1342	28S-13E-9	Phillips, #A-9 Bentsen
1343	28S-13E-9	Phillips, #A-11 Bentsen
1344	28S-13E-9	Phillips, #A-12 Bentsen
1347	28S-13E-9	TN Gas, #23 Slick
1348	28S-13E-9	Cont'l., #4 Bentsen
1349	28S-13E-4	Hawn&Heard,#2Heard
1350	28S-13E-2	Sun, #B-3 Bentsen
1351	28S-13E-9	Sun, #A-4 Bentsen
1352	28S-13E-1	Sun, #B-1 Bentsen
1355	28S-13E	Shell, #1 Barrera
1356	28S-13E-6	Sun, #1 Montgomery
1358	28S-13E	Shell, #1 Brannon
1360	28S-13E-4	Shell, #2 Heard Heirs
1364	28S-13E-5	CNG Prod., #1 Hudnall
1365	28S-14E-4	Shell, #1 Coates-Newmt'
1367	28S-14E-1	Shell, #31 McAllen
1368	28S-14E-2	Shell, #28 McAllen
1370	28S-14E-2	Shell, #27 McAllen
1371	28S-14E-1	Shell, #35 McAllen
1372	28S-14E-1	Shell, #36 McAllen
1373	28S-14E-1	Shell, #34 McAllen
1374	28S-14E-1	Shell, #32 McAllen
1375	28S-14E-1	Shell, #33 McAllen
1376	28S-14E-1	Shell, #40 McAllen
1377	28S-14E-2	Shell, #41 McAllen
1378	28S-14E-1	Shell, #37 McAllen
1379	28S-14E-2	Shell, #38 McAllen
1381	28S-14E-1	Shell, #45 McAllen
1382	28S-14E-1	Shell, #75 McAllen
1384	28S-14E-2	Shell, #57 McAllen
1386	28S-14E-1	Shell, #59 McAllen
1387	28S-14E-3	Taylor, #3 Christian
1388	28S-14E-2	Shell, #61 McAllen
1389	28S-14E-2	Shell, #71 McAllen
1390	28S-14E-3	Contl', #1 Christian
1392	28S-14E-2	Taylor Oil, #5 McAllen
1393	28S-14E-3	Taylor Oil, #2 Woods
1394	28S-14E-9	Taylor Oil, #1 Alex.
1396	28S-14E-1	Forest, #13 McAllen
1397	28S-14E-1	Forest, #16 McAllen
1398	28S-14E-1	Forest, #18 McAllen
1399	28S-14E-1	Forest, #17 McAllen
1401	28S-14E-1	Forest, #8 McAllen
1404	28S-14E-1	Forest, #11 McAllen
1405	28S-14E-1	Forest, #4 McAllen
1406	28S-14E-1	Forest, #5 McAllen
1407	28S-14E-1	Forest, #7 McAllen
1408	28S-14E-1	Forest, #6 McAllen
1409	28S-14E-7	Inv. Syn., #1 Turner
1410	28S-14E-9	Burch, #1 McKee
1411	28S-14E-1	Forest, #2 McAllen
1413	28S-14E-2	Shell, #18 Christian
1414	28S-14E-2	Shell, #14 Christian
1415	28S-14E-3	Shell, #22 Christian
1416	28S-14E-2	Shell, #20 Christian
1417	28S-14E	Shell, #7 Christian
1418	28S-14E-2	Shell, #8 Christian
1419	28S-14E-2	Shell, #9 Christian
1420	28S-14E-1	Shell, #29 McAllen
1421	27S-14E-8	Shell, #3 Christian
1422	28S-14E-2	Shell, #2 Christian
1423	28S-14E-2	Shell, #4 Christian
1424	28S-14E-2	Shell, #24 McAllen
1425	28S-14E-2	Shell, #22 McAllen
1427	28S-14E-6	Shell, #C-1 McAllen
1429	28S-14E-2	Shell, #1 Christian
1432	28S-14E-2	Shell, #10 McAllen
1433	28S-14E-2	Shell, #19 McAllen
1434	28S-14E-2	Shell, #20 McAllen
1435	28S-14E-6	Shell, #21 McAllen
1437	28S-14E-2	Shell, #13 McAllen
1438	28S-14E-1	Shell, #15 McAllen
1439	28S-15E-6	Shell, #1 Polis
1441	28S-15E-6	Texaco, #7 Guerra
1442	28S-15E-5	Shell, #1 Schmidt
1443	28S-15E-1	Texkan Oil, #1 Guerra
1444	28S-15E	Union-CA, #1 Guerra
1445	28S-15E-9	Texkan, #1 Hinojosa
1446	28S-15E-4	Texaco, #8 Guerra
1447	28S-15E-4	Texaco, #20 Guerra

Well #	Tobin No.	Well Name
1448	28S-15E-7	Humble, #1 Liew
1449	28S-15E-9	Belco, #1 Guerra
1450	28S-15E-6	Mitchell, #1 Ford
1451	28S-16E-4	Humble, #10 Shepperd
1452	28S-16E	Shell, #1 Guerra
1453	28S-16E-4	Humble, #14 Shepperd
1454	28S-16E	Humble, #11 Shepperd
1455	28S-16E	Humble, #9 Shepperd
1458	28S-16E-5	Humble, #5 Del Ray
1459	28S-16E-3	Argo&Coates, #1 Guerra
1460	28S-16E-7	Forest, #1 Schaleben
1461	28S-16E-8	Humble, #5 Shepperd
1462	28S-17E-9	Forest, #1 Rodman
1463	28S-17E-4	Amoco, #1 Corbett
1464	28S-17E-8	Superior, #1 Banker
1465	28S-17E-3	Holmes, #1 Mathieu
1466	28S-17E	Humble, #18 Kleberg
1467	28S-17E-1	Humble, #14 Kleberg
1468	28S-17E-1	Exxon, #36 Stillman
1469	28S-17E-7	TX Co., #2 Corbett
1470	28S-17E-2	Humble, #12 Kleberg
1471	28S-17E	McGarr&..., #1 Corbett
1472	28S-17E-1	Humble, #8 Kleberg
1473	28S-17E-1	Humble, #5 Kleberg
1474	28S-17E-1	Humble, #7 Kleberg
1475	28S-17E	Exxon, #24 Stillman
1476	28S-17E	Exxon, #40 Kleberg
1477	28S-17E-1	Exxon, #37 Stillman
1478	28S-17E-9	Smith, #1 McAllen
1479	28S-17E-9	Smith, #1 Fst. Bank-Cin
1480	28S-17E-1	Exxon, #41 Stillman
1481	28S-17E-2	Exxon, #39 Stillman
1482	28S-18E-7	Coastal St., #1 Conley
1483	28S-18E-7	Humble, #B-1 Garcia
1484	28S-18E-9	Monsanto, #1 Myers
1486	28S-18E-4	Tidewater, #1 Bakke
1487	28S-18E-4	Heep, #1 Garcia-Dough.
1488	28S-18E-4	DeLange, Yturria
1490	28S-19E-9	TX Co., #1 S.Fruit
1491	28S-19E-7	Humble, #1 Deming
1492	28S-19E-9	Geodynamics, #1 Morrow
1493	29S-9E-4	Atl.Rfng., #1 Saenz
1494	29S-10E-6	Owen&Moss, #4 Parks
1495	29S-10E	Shell, #1 Lehman
1499	29S-11E-1	Contl', #D-25 Garcia
1501	29S-11E-6	Contl', #I-6 Garcia
1502	29S-11E-1	Contl', #D-11 Slick
1504	29S-12E	Contl', #2 Champion
1505	29S-12E-4	Sun, #A-4 Frost Bank
1506	29S-12E-7	Cox, #1 Samano
1507	29S-12E-5	Contl', #1 Champion
1508	29S-12E-5	Sun, #32 Garcia
1509	29S-12E-2	TN Gas, #C-7 Slick
1510	29S-12E-9	Sun, #A-1 LaBrisa
1511	29S-12E-5	Brown, #1 Slick
1512	29S-12E-5	Bass..., #1 Yturria
1513	29S-12E-9	Sun, #20 Reilly
1514	29S-12E-7	Haring, #1 DeFlores
1515	29S-12E-5	Sun, #33 DeGarcia
1516	29S-12E-4	Sun, #C-4 GaciaL-L
1517	29S-12E-5	Birdwell, #1 Garcia
1518	29S-12E-5	Murphy, #1 Flores
1519	29S-12E-3	Tenneco, #4 Slick-A
1520	29S-12E-1	Baldridge.., #3 Slick
1521	29S-12E-2	Contl', #123 Slick
1522	29S-12E-6	Texaco, #6 Bloomberg
1523	29S-12E-2	Monsanto, #1 Slick
1524	29S-12E-6	Coastal St., #2 Slick
1525	29S-12E-2	Huisache, #3 Davenport
1526	29S-12E-1	Baldridge.., #1 Slick
1527	29S-12E-4	Ark.Fuel, #1 LaBrisa
1528	29S-12E-7	Haring, #1 Bliss
1529	29S-12E-9	Sun, #B-32 Frost Bk.
1530	29S-12E-2	Monsanto, #1 Daven.
1531	29S-12E-6	Texaco, #5 Bloomberg
1532	29S-13E-7	Harkins, #2 Texan
1534	29S-13E-1	Cleary, #1-2 Wiesehan
1535	29S-13E	Coastal St., #1 Coates
1536	29S-13E-1	Cleary, #1-7 Davis
1537	29S-13E-1	Cleary, #2-7 Davis
1538	29S-13E-4	Coastal St., #5 Jeffress
1539	29S-13E-4	Coastal St., #4 Jeffress
1540	29S-13E-4	Coastal St., #6 Jeffress
1541	29S-13E-5	Coastal St., #7 Jeffress
1542	29S-13E-5	Coastal St., #1 Brann
1543	29S-13E-6	Coastal St., #1 Flores
1544	29S-13E	Coastal St., #1 Castillo
1545	29S-13E-4	Coastal St., #2 Jeffress
1546	29S-13E-4	Coastal St., #3 Jeffress
1547	29S-13E-8	Douglas..., #1 Zamora
1548	29S-13E	Coastal St., #1 Zamora
1549	29S-13E-4	Coastal St., #1 Scherpe
1550	29S-13E	Amoco, #1 Hidalgo..
1551	29S-13E-9	Texaco, #1 Steen
1552	29S-13E	S.TX, #1 Texan Dvlp.
1553	29S-13E-4	Gulf, #1 Boston-TX
1554	29S-13E-1	Shell, #2 Hopkins
1555	29S-13E	Greenbrier, #1 Zamora
1556	29S-13E-7	Border Exp., #1 Edinburg
1557	29S-13E-2	Shell, #2 Boston-TX
1558	29S-13E-5	Shell, #9 Boston-TX
1560	29S-13E-1	Shell, #1 Davis
1561	29S-13E-2	Shell, #7 Boston-TX
1562	29S-13E-2	Shell, #A-1 Boston-TX
1563	29S-13E-2	Shell, #1 Boston-TX
1564	29S-13E-2	Shell, #3 Boston-TX
1565	29S-13E-2	Shell, #4 Boston-TX
1567	29S-13E-6	Shell, #3 Theiss
1568	29S-13E-1	Shell, #2 Theiss
1569	29S-13E-1	Wilson, #1 Lutz
1570	29S-13E-3	Phillips, #A-8 Bentsen
1571	29S-13E-4	Sun, #1 Zamora

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
1572	29S-13E-4	Sun, #2 Jefferies	1637	29S-18E-3	Superior, #1 Ely
1573	29S-13E-4	Sun, #1 Scherpe	1638	29S-18E-3	Kirkwood, #3 Russell
1574	29S-13E-7	Harrell, #4 Texan	1639	29S-18E-3	Superior, #2 Ely
1575	29S-13E-6	Harkins, #1 Dure,Anna	1640	29S-18E-3	Superior, #4 Todd
1576	29S-13E-1	Welder, #A-1 Wieseman	1641	29S-17E-9	Coastal St., #1 Hill
1578	29S-14E-1	Hargrave, #1 Turner	1642	29S-18E-9	Harkins, #1 McCorkle
1581	29S-14E-1	Hargrave, #1 Jackson	1645	29S-18E	Evco, #1 Gilbert
1582	29S-14E-1	Austral, #1 Vela	1646	29S-18E	Mitchell, #1 Cox
1583	29S-14E-1	TN Gas, #A-1 Turner	1647	29S-18E-1	Fairway, #1 Raymond
1584	29S-14E-4	Harkins, #1 Johnson	1648	29S-18E-1	Superior, #3 Chess...
1585	29S-14E-1	TN Gas, #2 Chandler...	1649	29S-19E-4	Geo..., #1 Cole
1586	29S-14E-3	Dunlap, #1 Aldridge	1650	29S-19E	Shell, #1 Gerdts
1587	29S-14E-6	TN Gas, #1 Hexter	1651	29S-19E-2	Hamon, #1 Inness
1588	29S-14E-1	Hargrave, #1 Chandler	1652	29S-19E-4	MPS Prod., #1 Martin
1589	29S-14E-6	Ada, #1 Hamman	1654	29S-22E-8	Pan Am, #1 St Tr 569
1590	29S-14E-5	Shell, #4 Hamman	1655	30S-12E-2	Sun, #B-18 Chapotal
1591	29S-14E-2	Harrell, #2 Roper	1657	30S-12E-5	Chicago, #11 Diaz
1592	29S-14E-8	Bright..., #1 Hamman	1658	30S-12E-5	TX O&G, #2 Diaz
1594	29S-14E-9	Texkan, #1 Edinburg	1659	30S-13E-1	Bel Oil, #1 Hidalgo
1595	29S-14E-6	McDermott, #1 Hexter	1660	30S-13E-1	Mokeen, #1 Lindsey
1596	29S-14E-9	Bel Oil, #2 Johnson	1664	30S-13E-6	Hawley, #5 Hidalgo
1597	29S-14E-9	Bel Oil, #3 Johnson	1665	30S-13E-7	Goldson, #1 Showers
1598	29S-14E-3	Humble, #1 Kotzur	1666	30S-13E-7	Mokeen, #1 Bender
1599	29S-14E-2	Hunt, #1 Wright	1667	30S-13E-7	Humble, #1 Texan
1600	29S-14E-2	Neathery, #1 Houts...	1668	30S-13E-9	Martin, #1 Tabasco
1601	29S-14E-1	Superior, #B-1 Hamman	1669	30S-13E-5	Mokeen, #1 Heard
1602	29S-15E-9	Gulf, #1 Shivers	1670	30S-13E-5	Mokeen, #1 Zamora
1603	29S-15E-7	Mobil, #9 Cruz	1671	30S-13E-5	Bettis, #1 Speer
1604	29S-15E-7	Harrell, #1 Hanks	1672	30S-13E-5	Mokeen, #1 Edinburg
1605	29S-15E-7	Tex-Star, #1 Alamo	1673	30S-13E-2	Mabee, #1 Fox
1606	29S-15E	Shoreline, #1 Hanks	1674	30S-13E-2	Varn, #1 Mitchell
1608	29S-15E-6	Mokeen, #1 Hanks	1675	30S-13E-2	British..., #1 Bohlman
1609	29S-15E-3	Ford, #1 Guerra	1676	30S-13E-4	Harkins, #1 Langhof
1612	29S-15E-2	Carrl, #1 DeVela	1677	30S-13E-8	Massengill, #1 Chapa
1613	29S-15E-4	Calvert..., #1 Hidalgo	1678	30S-13E-8	Tex-Star, #1 Bell
1614	29S-16E-4	Midalgo..., #1 Lacona	1679	30S-13E-3	Houston..., #1 Scherpe
1615	29S-16E-4	Gulf, #3 Lee	1681	30S-13E-8	Coastal St., #1 Murchison
1616	29S-16E-4	Gulf, #A-1 Lee	1682	30S-13E-8	Pickens, #1 Files
1617	29S-16E-1	Hargrave, #1 Rio	1683	30S-13E-8	TN Gas, #4 Chapa
1618	29S-16E-1	Magnolia, #B-1 Rio	1684	30S-13E-8	Kirkwood, #1 Waite
1619	29S-16E-1	Energy..., #B-2 Rio	1685	30S-13E-8	HoustonOil, #1 Bell
1620	29S-16E-2	Humble, #1 LaComa	1687	30S-13E-8	HoustonOil, #19 West
1621	29S-16E-2	Humble, #3 Shepperd	1688	30S-14E-2	Superior, #1 Shary
1622	29S-16E-2	Humble, #6 Shepperd	1689	30S-14E-7	Lone Star, #1 Cross
1623	29S-16E-3	Humble, #12 Shepperd	1690	30S-14E-7	Mokeen, #1 Campbell
1624	29S-16E-9	Atl.Rich., #2 Smith	1691	30S-14E-7	Ark.Fuel, #1 Listen
1625	29S-16E-9	Gulf, #1 Taylor	1692	30S-14E-9	Carter Jones, #1 Reinbold
1626	29S-16E-9	W.Nat.Gas, #1Roberts	1693	30S-14E-9	HoustonOil, #1 Gillman
1627	29S-16E-9	Magnolia, #1 Cruz	1694	30S-14E-9	HoustonOil, #A-1Hidalgo
1628	29S-17E-1	Coastal St., #5 Todd	1695	30S-14E-9	Mitchell, #1 Luitjen
1629	29S-17E-2	Inexco, #1 Hidalgo...	1696	30S-15E-7	Gulf, #1 Wolcott
1630	29S-17E-2	Pan Am, #1 Rio	1697	30S-15E-1	Hamill, #1 Hidalgo
1632	29S-17E-6	Bentsen, #1 Leal	1698	30S-15E-7	Tenneco, #1 Slusser
1633	29S-17E-6	Flournoy, #1 Leonard	1699	30S-15E-7	Tenneco, #1 Haddock
1634	29S-18E-2	Pan Am, #1 Morrow	1700	30S-15E-7	Tenneco, #1 Garza
1635	29S-18E-2	Amoco, #3 Oberg Gas	1701	30S-15E-7	Tidewater, #1 Haddock

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
1702	30S-15E-7	Tenneco, #1 Yingling	1764	31S-14E-6	Ramada, #1 Myatt
1703	30S-15E-4	Bateman, #1 Knops	1765	31S-14E-6	Delhi..., #2 Wiladel
1704	30S-15E-4	Kelly- Brock, #1 Cortez	1766	31S-14E-6	Delhi..., #1 Young
1705	30S-15E-5	Westland, #1 Heinzleman	1767	31S-14E-6	TN Gas, #1 Shary
1706	30S-15E-5	Westland, #1 Callaway	1769	31S-14E-6	Shoreline, #1 Weid
1708	30S-15E-5	Mobil, #1 Edinburg	1770	31S-14E-1	Mokeen, #1 Demaree
1709	30S-15E-1	Marline, #1 Cross	1771	31S-14E-1	Kidd, #1 Fisher...
1710	30S-15E-1	Harrell, #1 N.O.RR Co.	1772	31S-14E-1	Mokeen, #1 Cavazos
1711	30S-15E-1	Chiles, #1 Muecke	1773	31S-15E-4	D.Taylor, #4 Bales
1712	30S-15E-1	Chiles, #1 Skinner	1774	31S-14E-7	Mayfair, #1 Hackney
1713	30S-15E-9	Engeo, #1 Robinson	1775	31S-14E-7	Union, #B-2 Savage
1714	30S-15E-9	Texkan, #1 Laughlin	1776	31S-14E-7	Mayfair, #1 Elkins
1715	30S-15E-9	McCormick, #1 Campbell	1778	31S-14E-7	Inexco, #1 Frost
1716	30S-15E-9	Bright..., #1 Linn	1779	31S-15E-7	D.Taylor, #1 Brown
1717	30S-15E-9	Harrell, #1 Erdman	1782	31S-15E-6	D.Taylor, #15 Fieldwide
1718	30S-15E-9	Mellon, #1 Gearhart	1783	31S-15E-6	Taylor, #1 Stugard
1719	30S-15E-9	Sinclair, #1 Robinson	1784	31S-15E-9	Bettis, #2 Baldwin
1720	30S-15E-9	Texkan, #1 Weiderhold	1785	31S-15E-9	Bettis, #1 Guaranty
1721	30S-15E-9	Texkan, #1 Carlson	1786	31S-15E-9	Taylor, #1 Sherrill
1722	30S-15E-2	Carrl, #1 Anderson	1787	31S-15E-4	D.Taylor, #1 Renken
1724	30S-16E-8	Union, #1 Vasquez	1788	31S-15E-9	Bettis, #1 Baldwin
1726	30S-16E-5	Amoco, #34 La Blanca	1789	31S-15E-4	D.Taylor, #34 McAllen
1727	30S-16E-8	Union, #1 Anderson	1791	31S-15E-4	Fair, #1 Etchison
1728	30S-16E-7	Pan Am, #5 LaBlanca-2	1792	31S-15E	D.Taylor, #1 Esparaza
1729	30S-16E-7	Pan Am, #3 LaBlanca-2	1794	31S-15E-4	D.Taylor, #31 McAllen
1730	30S-16E-5	Pan Am, #19 LaBlanca	1795	31S-15E-4	Tenneco, #43 Field-Mc.
1731	30S-16E-2	Pan Am, #25 LaBlanca	1797	31S-15E-9	Delange, #1 White
1732	30S-16E-5	Pan Am, #18 LaBlanca	1798	31S-15E-6	D.Taylor, #18 Pharr
1733	30S-16E-4	Union, #2 Wysong	1799	31S-15E-7	Tenneco, #19 Pharr
1734	30S-16E-6	LaGloria, #2 LaBlanca	1801	31S-15E-3	Harrell, #1 Cuthbert
1735	30S-16E-8	Coastal St., #1 Kuhn	1802	31S-15E-6	Occid., #1 Foster
1736	30S-17E-7	Tex-Star, #5 Painter	1803	31S-15E-6	Maguire, #1 San Juan
1737	30S-17E-9	Hope, #1 Smith	1805	31S-15E-8	MPS, #1 Kelly
1738	30S-17E-2	Standard, #1 Rio	1806	31S-15E-8	Union, #2 Husband
1739	30S-18E-4	Texaco, #1 Johnson	1807	31S-15E-8	Cox, #2 Meyerhoff
1740	30S-18E-5	Union-CA, #1 Bell	1808	31S-15E-8	Sun, #A-1 Godinez
1741	30S-18E-3	Carrl, #1 Nance	1809	31S-15E-8	MPS, #1 Tanner
1742	30S-18E-3	Humble, #1 Austin	1811	31S-15E-8	Union, #1 Husband
1744	30S-19E-9	HoustonO&M, #1 Bouldin	1813	31S-15E-8	Sun, #A-2 Godinez
1745	30S-19E-9	Gulf, #1 McDaniel	1814	31S-15E-8	Union, #1 Espensen
1746	30S-21E-3	Kirkwood,#A-1Armendiaz	1815	31S-15E-8	Sun, #1 Freeman
1747	30S-21E-3	Arriba, #1 Armendiaz	1816	31S-15E-8	Sun, #1 Jones
1748	30S-23E-4	Sundance, #1 Jones	1820	31S-15E-7	Harrell, #1 Lighthouse
1749	30S-23E-2	Magnolia, #1 Kerlin	1821	31S-15E-7	Harrell, #1 Brown
1750	31S-12E-1	Clark, #1 Baldridge	1822	31S-15E-7	Sinclair, #1 Schriener
1751	31S-12E-1	Pickens, #A-1LaJoya	1823	31S-15E-7	Sinclair, #2 Robe
1754	31S-13E-1	TX Co. #1 Citraland	1824	31S-15E-7	Wagner, #2 Robinette
1755	31S-13E-3	Coastal St., #1 Martin	1825	31S-15E-7	Wagner, #1 Robinette
1756	31S-13E-3	Dunbar, #1 Carpenter	1826	31S-15E-7	Harrell, #1 Cramer
1757	31S-14E-7	Bettis, #1 Shary	1827	31S-15E-7	Harrell, #1 Lammers
1758	31S-14E-7	Delhi..., #1 Crenshaw	1828	31S-15E-7	Sinclair, #1 Robe
1759	31S-14E-7	Petro.., Bank of SW	1829	31S-15E-4	Tenneco, #45 McAllen
1760	31S-14E-7	Tex-Star, #1 Whigman	1830	31S-15E-4	Tenneco, #35 McAllen
1761	31S-14E-7	Texkan, #1 Ferry	1832	31S-15E-9	Sun, #1 Doedyns
1762	31S-14E-1	Dawson, #1 Rochelle	1833	31S-15E-9	Coastal St., #1 Alcorn
1763	31S-14E-6	Carrl..., #1 Shivers	1834	31S-15E-9	Harrell, #1 Theser

Well #	Tobin No.	Well Name	Well #	Tobin No.	Well Name
1835	31S-15E-9	Mason, #1 Sherrill	1899	31S-16E-1	Clark, #1 Will
1836	31S-15E-5	Holmes, #1 Evans	1900	31S-16E-1	N.Pump, #2 Lockhart
1837	31S-15E-5	Holmes, #1 Taylor	1901	31S-16E-1	N.Pump, #1 Lockhart
1838	31S-15E-5	Taylor, #A-1 Kelly	1902	31S-16E-1	Viking, #1 Frost
1839	31S-15E-5	Taylor, #1 Atkinson	1903	31S-16E-1	N.Pump, #1 Thompson
1840	31S-15E-5	Taylor, #1 Espenson	1904	31S-16E-6	TX ETrans,#1 Donna-2
1843	31S-15E-5	Tenneco, #36 McAllen	1905	31S-16E-6	Stampede, #1 Tanner
1844	31S-15E-5	Tenneco, #23 Fieldwide	1906	31S-16E-6	N.Pump, #2 Henry
1846	31S-15E-5	Tenneco, #42 McAllen	1908	31S-16E-9	Mosbacher.., #1Park
1847	31S-15E-5	Tenneco, #41 McAllen	1909	31S-16E-9	Harrel, #1 Klehm
1848	31S-15E-5	Tenneco, #40 McAllen	1910	31S-16E-9	Lamar...,#1 Dempsey
1849	31S-15E-3	Tenneco, #46 McAllen	1912	31S-16E-4	Montego, #1 Trefz...
1850	31S-15E-5	Tenneco, #21 Fieldwide	1913	31S-16E-8	Sun, #A-1 O'Brien
1851	31S-15E-5	D.Taylor, #20 Fieldwide	1914	31S-16E	Harrell, #1 Armstrong
1852	31S-15E-8	Bettis, #1 Crutchfield	1915	31S-17E-3	N.Pump, #3 Harris
1855	31S-15E-3	Kennard, #1 Whitted	1916	31S-16E	Forest, #1 Waters
1856	31S-15E-3	Engeo, #1 Chapapas	1917	31S-17E-3	Forest, #1 Pettis
1857	31S-15E-3	Appell, #1 Moore	1918	31S-17E-6	MacDonald, #1 Pettis
1858	31S-15E-3	Tenneco, #4 W.McAllen	1919	31S-17E-3	Forest, #1 Meyers
1860	31S-15E-3	Fair, #1 Fee	1920	31S-17E-6	May Petro, #1 Neuhaus
1861	31S-15E-3	Texkan, #3 Whitted-1	1922	31S-17E	Bettis..., #1 Baingo
1863	31S-15E-3	D.Taylor, #30 McAllen	1923	31S-17E-3	N.Pump, #4 Henry
1864	31S-15E-3	D.Taylor, #1 Collavo	1925	31S-17E-1	Moody, #2 O'Quinn
1865	31S-16E-7	Tidewater, #1 Donna	1926	31S-18E-3	Hydrocarbon,#1Bevers
1866	31S-16E-7	S.Minerals, #1 Lucas	1927	31S-20E-4	Voss, #1 Duncan
1867	32S-16E-1	LaGloria, #7 S.Weslaco	1928	31S-20E-4	Wilson, #1 Bowie-12
1868	32S-16E-1	Goldking, #1 Stites	1929	31S-20E-7	AL Co., #1 Laakso...
1869	31S-16E-7	Lone Star, #1 Denzer	1930	31S-20E-5	Chevron, #1 Rodriguez
1870	31S-16E-7	King, #1 Boyce	1931	32S-14E-1	TX Co., #1 Hidalgo
1871	32S-16E-1	Amoco, #17 S.Weslaco	1932	32S-14E-2	Am.Petro., #2 DeRueda
1872	32S-16E	Amoco, #24 S.Weslaco	1933	32S-14E-1	Wagner, #1 Parmelee
1873	31S-16E-7	Amoco, #22 S.Weslaco	1934	32S-15E-4	Edinburg, #1 Fee
1874	32S-16E-1	Amoco, #25 S.Weslaco	1935	32S-15E-4	Appell, #1 DeCantu
1875	31S-16E-7	Amoco, #26 S.Weslaco	1936	32S-15E-3	Harrell, #1 Anderson
1876	31S-16E-2	Texkan, #1 Nolan	1937	32S-15E-3	Harrell, #1 Savage
1877	31S-16E-2	Union, #1 Kolberg	1938	32S-15E-1	Wagner, #2 Young
1878	32S-16E-1	Amoco, #21 S.Weslaco	1939	32S-15E-1	Tierra, #1 Foran
1879	31S-16E-2	Shepherd, #1 Clements	1940	32S-15E-1	Sinclair, #2 Houston
1880	31S-16E-2	Union, #1 Gerber	1941	32S-15E-1	Sinclair, #1 Santa Anna
1881	31S-16E-1	Cox, #1 Terveen	1942	32S-15E-1	Goldston, #1 Krenmueller
1882	31S-16E-2	Cox, #1 Terveen	1943	32S-15E-6	Texkan, #1 First Ntl.
1883	31S-16E	Union, #1 Calloway	1944	32S-15E-6	Winn, #1 First Ntl.
1884	31S-16E-2	Union, #1 Owens	1945	32S-15E-4	Bettis..., #1 Vela
1885	31S-16E-2	Union, #1 Hernandes	1946	32S-15E-4	Union, #1 Cronk
1886	31S-16E-2	Anschutz,#1 Hambrick	1947	32S-15E-4	Sun, #2 Kelley
1887	31S-16E-7	LaGloria, #8 S.Welaco	1950	32S-15E-3	Harrell, #1 Kelley
1888	31S-16E-6	Neuhaus, #1 Marshall	1952	32S-15E-2	Garland, #1 Slavik
1889	31S-16E-5	Harkins, #1 Johnson	1953	32S-15E-2	Steward..., #1 Schus.
1890	31S-16E-5	J&C Drlg., #1Woodman	1954	32S-15E-2	MPS, #2 Tanner
1891	31S-16E-5	Hamon, #1 Davis	1955	32S-15E-2	MPS, #1 GoldenFruit
1892	31S-16E-6	N.Pump, #1 Hall	1956	32S-15E-2	MPS, #1 Schuster
1893	31S-16E-6	Neuhaus, #1 Jones	1957	32S-15E-2	MPS, #1 SchusterOil
1894	31S-16E-6	Neuhaus, #1 Bray	1958	32S-15E-5	Bettis..., #1-5 St Tr
1895	31S-16E-6	Dillon, #1 Taormina	1960	32S-15E-2	Bettis..., #1 Doffing
1897	31S-16E-6	Neuhaus, #1 Wood	1961	32S-16E-4	Dansfiell, #1 Schuster
1898	31S-16E-1	Bright..., #1 Boles	1962	32S-16E-4	Petro., #1 Cisneros

Well #	Tobin No.	Well Name
1964	32S-16E-4	Cox, #1 Jackson
1966	32S-16E-5	Geochemical, #1 Waters
1967	32S-16E-5	Cox, #2 McManus
1968	32S-16E-5	Bakke Oil, #1 McManus
1969	32S-16E-5	Moody, #2 Ripley
1971	32S-16E-6	LaGloria, #11 S.Weslaco
1974	32S-16E-3	MacDonald, #1 West
1976	32S-16E-2	Anderson, #1 Boyce
1977	32S-16E-3	Sinclair, #1 Swallow
1978	32S-16E-3	Amoco, #5 Sweeney
1979	32S-16E-3	Arco, #6 Swallow
1980	32S-16E	Atl.Rich., #2 Buchanan
1981	32S-16E-3	Sun, #1 Singer
1984	32S-16E-3	Harrell, #1 Sanders
1986	32S-16E-3	Atl.Rich., #2 Gomez
1987	32S-16E-2	Bay Rock, #1 Streib
1988	32S-16E-2	Bakke, #1 Hubbard
1989	32S-16E-2	Amoco, #1 Tyner
1990	32S-16E-2	Sun, #1 Tyner
1991	32S-16E-2	King, #2 Boyce
1992	32S-16E-2	Bakke, #1 Peters
1993	32S-16E-6	Bentsen, #1 TX-8
1994	32S-16E-6	Am.Petro., #3 Ramey
1995	32S-16E-6	Am.Petro., #5 Ramey-1
1996	32S-16E-5	Stanolind, #1 Carlson
1997	32S-16E-6	Amoco, #1 Ector
1998	32S-16E-6	Bettis..., #1 Swallow
1999	32S-16E-6	Bettis..., #2 Ramey
2000	32S-21E-6	Dow, #1 Continental
2001	32S-22E-1	Gulf, #2 LagunaMadre

APPENDIX B: DATA FILE

This data file contains all of the well log information used in this study. That is, it includes both the information gathered in Bodner's study (well numbers 26 through 762) and all the information gathered for this study (well numbers greater than 762). In all, information from 2271 wells were used. In addition, temperature data (^{o}F) have been corrected using the Kehle temperature correction method and depth data (feet) have been converted to depths relative to sea level.

ID UTM COORDINATES DEPTH/TEMPERATURE PAIRS

26 3177887.0 648361.1 9219 238 0 0 0 0 0 0 0 0 0 0
27 3176823.0 655861.1 9184 250 10900 304 0 0 0 0 0 0 0 0
28 3176547.0 649312.5 8867 246 0 0 0 0 0 0 0 0 0 0
30 3176406.8 656315.2 9334 244 9985 291 0 0 0 0 0 0 0 0
31 3177516.5 655821.0 9265 240 10206 284 0 0 0 0 0 0 0 0
32 3177551.0 656539.1 1791 110 8806 241 10298 288 0 0 0 0 0 0 0 0
33 3176462.4 660931.6 8819 242 12316 323 0 0 0 0 0 0 0 0
34 3181243.9 669796.8 8835 241 13100 347 13925 369 0 0 0 0 0 0
35 3166752.7 647218.9 11243 290 8789 223 0 0 0 0 0 0 0 0
36 3205702.1 604327.8 10820 268 0 0 0 0 0 0 0 0 0 0
38 3204547.3 599632.4 11101 282 0 0 0 0 0 0 0 0 0 0
40 3204069.3 602225.9 10740 261 0 0 0 0 0 0 0 0 0 0
42 3198193.7 632631.9 9900 237 13887 329 0 0 0 0 0 0 0 0
43 3199494.9 631792.8 9355 240 11655 283 13652 326 0 0 0 0 0 0
44 3200374.2 633968.9 8018 252 14147 350 0 0 0 0 0 0 0 0
45 3197338.1 630425.1 6040 199 8640 225 9090 226 0 0 0 0 0 0 0 0 0 0
47 3202248.5 625171.8 13033 292 0 0 0 0 0 0 0 0 0 0
49 3201216.0 633440.2 16174 383 16816 344 18178 370 0 0 0 0 0 0
50 3198612.0 626772.3 12912 316 15594 318 17919 404 20673 432 0 0 0 0
51 3208560.0 646006.2 9812 241 0 0 0 0 0 0 0 0 0 0
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1868	2887735.9	595960.0	8406	209	0	0	0	0						
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1900	2899514.3	599440.3	10274	251	11279	261	0	0						
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1980	2889564.2	589046.4	7851	212	0	0	0	0		
1981	2888931.4	591184.4	7174	194	0	0	0	0		
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1986	2888761.1	589209.3	8519	241	9169	261	9360	268		
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1988	2885314.9	595448.5	5994	173	0	0	0	0		
1989	2889440.2	592218.4	9011	240	0	0	0	0		
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1995	2881256.5	596299.6	8724	240	9707	261	9853	262		
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2012	3198903.4	586559.3	6132	175	0	0				
2013	3205431.9	585891.6	5723	179	0	0				
2015	3206582.1	650232.1	1195	113	10276	244				
2018	3197298.7	656912.6	7138	201	9103	241				
2019	3198189.3	647170.6	7233	219	0	0				
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2028	3195997.6	656059.5	7475	209	9728	239				
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2038	3189668.5	620124.6	2597	121	0	0				
2039	3181724.9	616188.0	6090	188	0	0				
2040	3192799.7	626134.0	8107	219	8333	220				
2042	3180791.9	625680.1	2273	146	3240	159				
2044	3182362.4	645716.2	7780	205	8529	215				
2045	3187701.6	653655.2	8801	230	0	0				
2046	3183343.3	656063.7	5322	166	0	0				
2047	3190065.7	647324.1	7564	228	0	0				
2048	3188085.9	650072.6	8207	205	0	0				
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2054	3184349.1	657769.5	2813	132	9271	249				
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2069	3174894.8	570622.1	7275	197	0	0				
2073	3171348.9	618277.7	7609	199	9368	223				
2074	3167650.6	617929.6	6476	200	7177	189	7814	214	0	0
2075	3167437.1	610085.1	6324	195	6402	196				
2076	3169014.6	611005.7	6167	180	6927	203				
2077	3178117.0	617371.9	8833	212	0	0				

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2080	3176754.1	631982.3	5357	162	0	0				
2081	3175405.3	622633.3	7131	207	0	0				
2083	3176852.0	641455.8	5019	153	0	0				
2084	3173956.4	649985.8	3628	143	9566	243				
2085	3176966.0	656091.9	1735	115	9286	251				
2086	3176425.3	646961.4	1326	108	4457	152	9728	250	0	0
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2623 3054999.0 646327.1 10198 225 10444 229

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2631	3048979.6	669351.8	9513	219	10544	258								
2632	3043770.5	662788.7	9784	228	0	0								
2633	3044649.0	661865.4	8978	228	0	0								
2634	3045111.0	661479.5	8917	222	0	0								
2635	3056377.2	671047.3	9307	206	0	0								
2636	3043928.8	667716.4	9538	217	0	0								
2637	3044390.0	665973.0	8878	215	10069	231								
2638	3043125.4	671706.3	8984	220	10990	261								
2639	3028312.6	474267.5	6559	191	0	0								
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2649	3036700.2	504881.5	6470	214	8044	240								
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2653	3039261.4	565420.6	2732	131	0	0								
2654	3039709.3	566943.8	2792	136	0	0								
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2660	3041974.7	610236.0	7543	201	0	0								
2661	3042033.3	610570.0	7744	208	0	0								
2662	3037133.4	610312.5	8447	212	0	0								
2663	3035569.4	622635.9	1977	112	7456	217	8857	225	9134	229				
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2665	3036689.0	636101.5	9039	208	9548	221	10461	236	11555	261				
2666	3034020.0	635153.8	9710	215	0	0								
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2670	3029674.1	624380.2	2002	120	9476	234								
2671	3030765.4	631413.9	10457	234	0	0								
2672	3040650.1	632950.4	9368	219	10553	258								
2673	3037470.1	631899.3	8663	204	9262	210								
2676	3038730.1	636290.0	9381	211	9507	211	10245	242	0	0				
2677	3038536.3	643941.6	8784	204	0	0								
2678	3032057.0	642011.3	7937	199	9278	218								
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2683	3016821.9	461107.7	1583	126	3906	153	5073	171	0	0				
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2685	3027178.6	479909.8	7263	201	0	0								
2687	3027120.3	478949.5	7135	215	0	0								
2688	3019006.4	486747.2	5466	169	6463	183								
2689	3017011.3	494483.6	151	121	6200	201	6498	208	7076	218				
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2692	3016979.7	499047.4	6791	219	0	0								
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2737 3016355.7 624947.9 9455 234 0 0
2738 3021466.7 628148.3 9988 210 10088 240
2739 3019607.9 627981.9 10489 228 0 0
2740 3015952.3 627246.9 2508 120 8084 207

APPENDIX C: TEMPERATURE CORRECTION METHODS

This appendix gives a description of three temperature correction methods other than the Kehle method: the Horner plot (Dowdle and Cobb,1975; Fertl and Wichmann, 1977; Majorowicz and others, 1984; Chapman and others, 1984; Archer and Wall, 1986), Roux and others (1980), and Middleton (1979). For a description of the Kehle method, see text. The following discussion also includes reasons why the Kehle method was used to correct the temperature data and suggestions on how to make a comparison between the various temperature correction methods.

Horner Plot

The Horner plot is widely used in the geothermal industry to estimate the true, static formation temperature from bottom-hole temperature data (Roux and others, 1980). The Horner plot (Fig. C1) is a semi-log graph in which the buildup temperature is plotted against dimensionless Horner time, $(t_k + \Delta t)/\Delta t$, where t_k is the circulation time and Δt is the time since circulation has stopped before the bottom-hole temperature is taken. The data points on the graph represent bottom-hole temperatures taken at successive times at the same depth. (These different bottom-hole temperatures are taken when different logging tools are sent down the hole). The data points are then fitted to a straight line which is extrapolated to a dimensionless Horner time of unity. It is the y intercept of the plot, T_i (Fig. C1) which is assumed to be the true, static formation temperature.

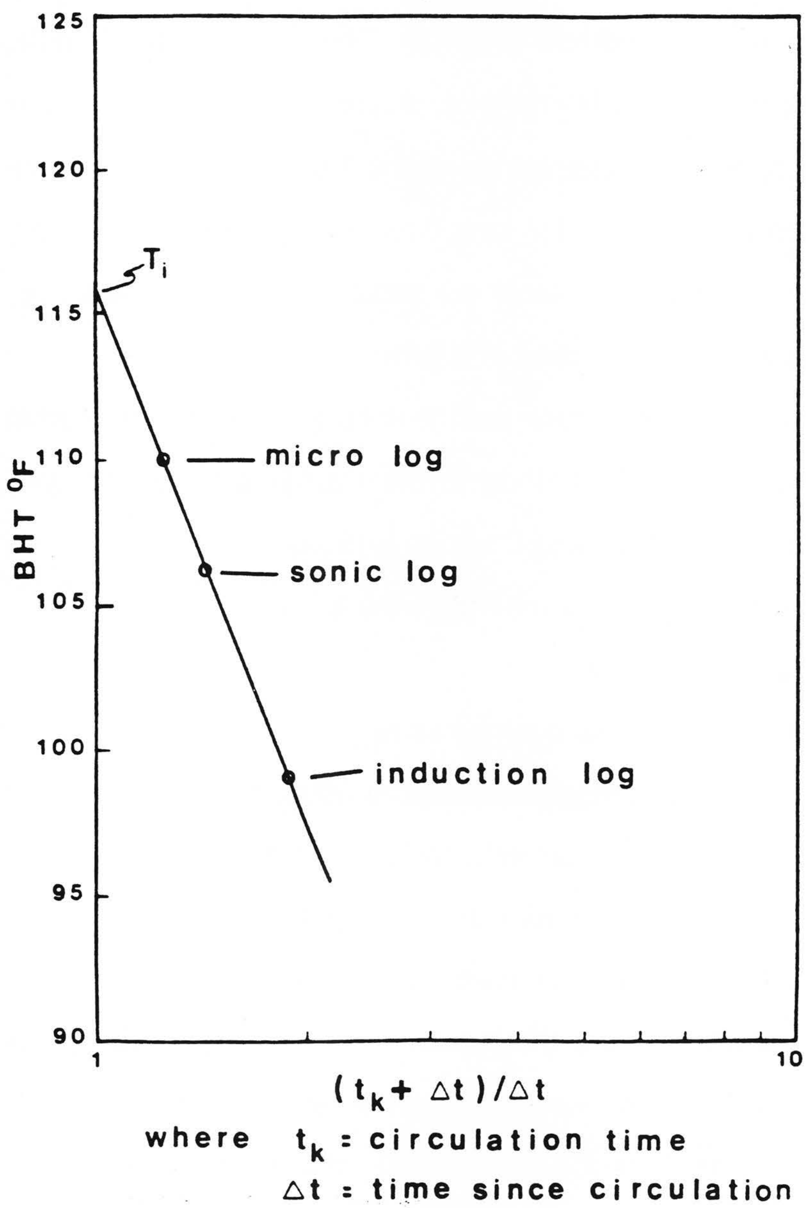


Figure C1. Semi-log graph of the Horner plot. The data points on the graph represent bottom-hole temperatures taken at successive times at the same depth (modified from Dowdle and Cobb, 1975).

Roux and others (1980) Temperature Correction Method

The correction method given by Roux and others (1980) is an attempt to improve on the Horner plot. According to the authors, the static formation temperature obtained using the Horner plot is lower than the true formation temperature for long circulating times. In addition, they stated that this method calculates the static formation temperature, more easily, using early shut-in data and provides a closer approximation to the true formation temperature than that obtained from the Horner plot. However, this alternative method to the Horner plot has not yet been tested extensively (Jorden and Campbell, 1984).

The equation used for this method is the following:

$T_i = T^*_{ws} + m\, T_{DB}\,(t_{pd})$

where T_i= true static temperature

T^*_{ws} =false initial temperature obtained by extrapolation of a conventional Horner plot

m = slope of the Horner straight line

$T_{DB}(t_{pd})$ = dimensionless correction factor

The procedure for using this equation involves: 1) drawing a regular Horner plot of dimensionless Horner time $((t_k + \Delta t)/\Delta t)$ vs. bottom-hole temperature in order to find T^*_{ws} and m, 2) calculating t_{pd} using:

$t_{pd} = k\, t/C_p\rho\, r_w^2$

where k = thermal conductivity

t = time

C_p = specific heat capacity

ρ = density of the saturated rock

r_w = well bore radius

3) determining the range of $(t_k + \Delta t)/\Delta t$ that the shut-in data fall into (ranges are 1.25 to 2, 2 to 5, and 5 to 10), 4) looking at the graph (Fig. C2) which corresponds to the range of $(t_k + \Delta t) / \Delta t$ found and finding T_{DB} as a function of t_{pd}, and 5) calculating T_i using T^*_{ws}, m and $T_{DB}(t_{pd})$. Thus, this method requires knowledge of the rock's thermophysical parameters. Most well logs do not provide these data.

Middleton Temperature Correction Method

The Middleton temperature correction method is a method in which true formation temperature can be found using curve matching. Middleton (1979) used the equation:

$$BHT(t) = T_m + \Delta T\,(\mathrm{erfc}\ a/\tau)^2$$

where $BHT(t)$ = bottom-hole temperature as a function of time

T_m = temperature of the mud when circulation has stopped

$\Delta T = T_f - T_m$

T_f = true formation temperature

a = bore hole radius

$\tau = (4kt)^{1/2}$

k = thermal diffusivity

t = time

to generate a set of curves (Fig. C3a) that can be used to estimate true formation temperature by superposition on graphs of time-sequential

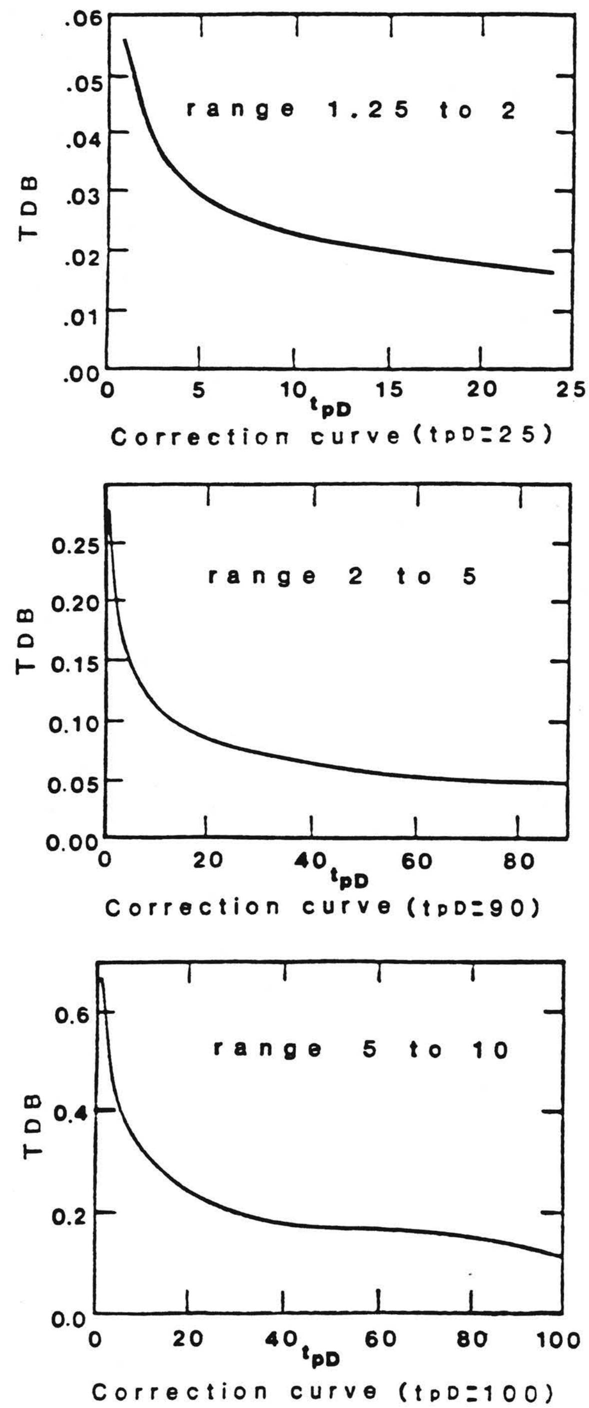


Figure C2. Set of curves used to determine T_{DB} as a function of t_{pd} (modified from Roux and others, 1980).

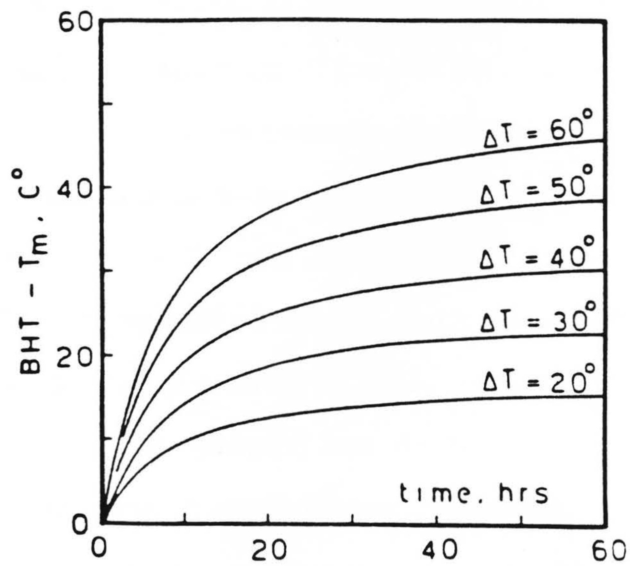


Figure C3a. Set of temperature stabilization curves based on Middleton's equation (from Middleton,1979).

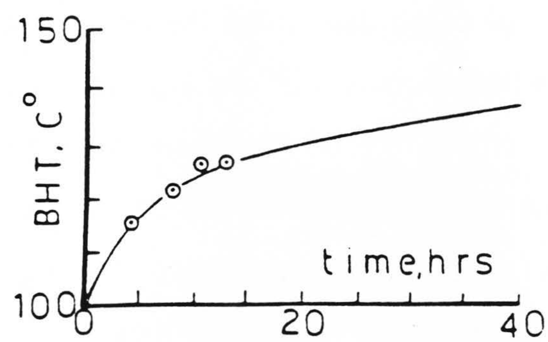


Figure C3b. Graph of bottom-hole temperature versus time since circulation stopped with model curve (from Middleton, 1979).

BHT measurements plotted at the same scale (Fig. C3b). However, according to Leblanc and others (1981) these type curves are inaccurate because the solution used by Middleton (1979) to derive the curves is not consistent with the initial conditions imposed on his model. To correct this inaccuracy, Leblanc and others (1981) generated a new set of type curves for different thermal diffusivities (Fig. C4). In addition, the temperature of the mud taken when circulation has stopped (T_m) is not considered to be very accurate. One other caveat with respect to the Middleton method is that like the method proposed by Roux and others (1980), this correction method has not been used extensively (Jorden and Campbell, 1984) and also requires more data than are typically available.

After looking at the various temperature correction methods, I decided to use the Kehle temperature correction method because it could be used to correct all of the data unlike the Horner plot and Roux and others methods which require multiple logs for each well. In addition, the Roux and others method requires knowledge of a rock's thermophysical parameters. The Middleton method was not considered because of the number of problems associated with it. Although I attempted to obtain other well logs (e.g. micro logs and sonic logs in addition to the induction-electric logs which I had access to) for the purpose of correcting bottom-hole temperatures with the Horner plot and the Roux and others methods, I was unsuccessful. Specifically, I contacted two oil companies which have many oil and gas wells in South

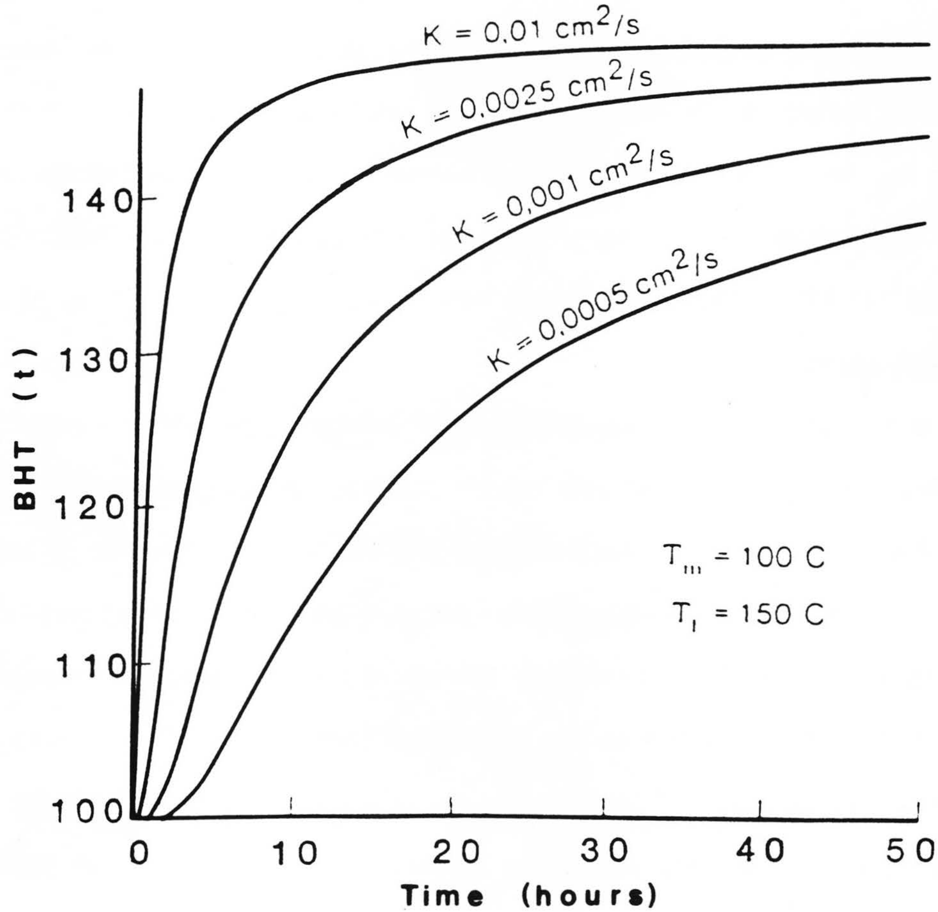


Figure C4. Set of temperature stabilization curves for different values of thermal diffusivity (from LeBlanc and others, 1981).

Texas and asked if well logs could be sent to me. Both companies agreed to send the logs that I had requested. However, the logs that were sent were not useful for the following reasons: 1) Not all the logs requested were available. 2) Not all the logs sent had time since circulation recorded. 3) Some logs that were taken at successive times require that the hole be reconditioned before the tools are sent down the hole. This restarts "time zero" with respect to time since circulation stopped. 4) Many of the logs were run at the same time instead of at successive times.

If multiple logs are available and if thermophysical parameters can be estimated for the Roux and others method, a comparison can be made between the Kehle method and the Horner plot and Roux and others methods in order to determine how well the Kehle method (with its limitations) corrects bottom-hole temperatures to static formation temperatures as opposed to the other two methods which take more variables into account. The following criteria are suggested for such a comparison: 1) The data should be located in a small part of the study area so that the comparison can be done without regard to regional trends in the data. 2) The small area should contain a large number of wells that have been drilled by the same oil company. This makes data acquisition easier and it allows a greater chance that enough data will be found so that a comparison can be made. 3) The scout tickets of each of the wells in the area of interest should be examined and only those wells for which three or more logs have been taken should be used. This last criterion is necessary in order to use the Horner plot and Roux and others methods. 4) The logs should be further examined and those that do not have time since circulation recorded should be discarded because these data are necessary with respect to the Horner plot and Roux and others methods. Thus, once all the information for the different temperature correction methods has been gathered, calculations can be made to determine how well the Kehle method corrects bottom-hole temperature measurements compared to the Horner plot and the Roux and others methods.

APPENDIX D: TEMPERATURE-DEPTH PLOTS

Temperature versus depth plots were generated for a number of subregions within the study area (Figure 22). The name of each plot identifies the plot's corresponding subregion. Specifically, TRE indicates that the data were taken over the entire subregion or where the data fell within the growth fault trends that ran through a particular subregion. OFF indicates that the data for the plot were taken from off the growth fault trends through a given subregion. Figure D1 is the location map of the plots.

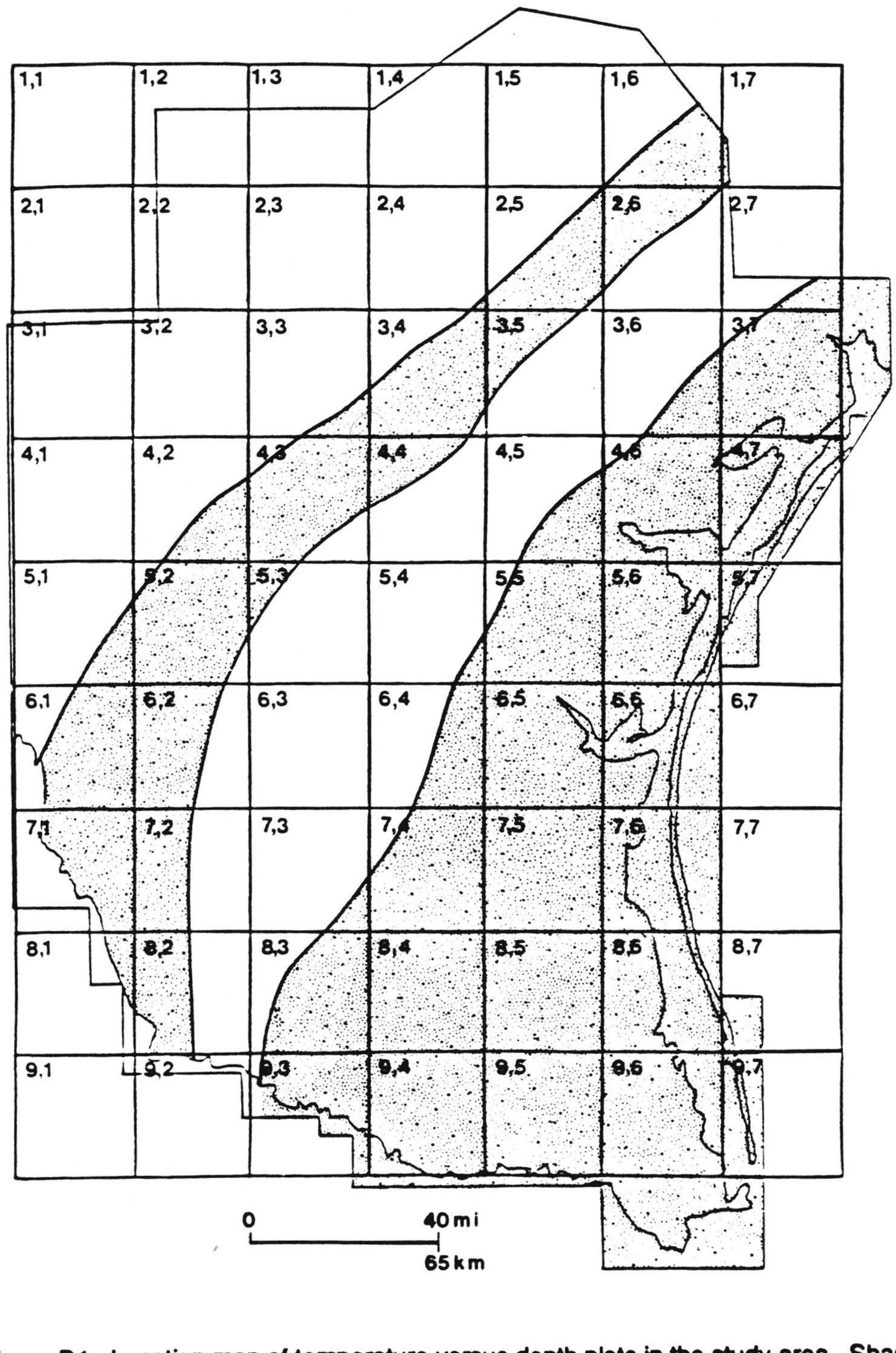
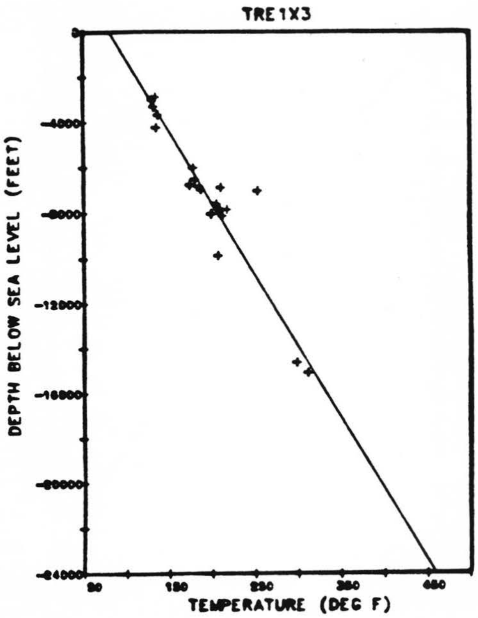


Figure D1. Location map of temperature versus depth plots in the study area. Shaded areas indicate the location of the Wilcox and Vicksburg/Frio growth fault zones.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DEPTH BELOW SEA LEVEL (FEET)
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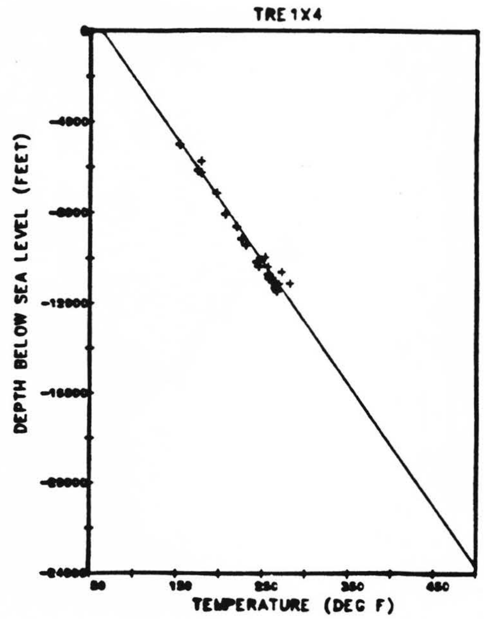
-12000
-16000
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)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DEPTH BELOW SEA LEVEL (FEET)
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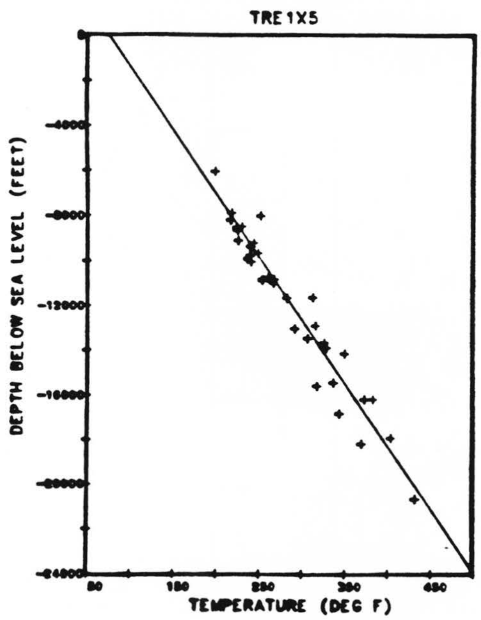
250
350
450
TEMPERATURE (DEG F)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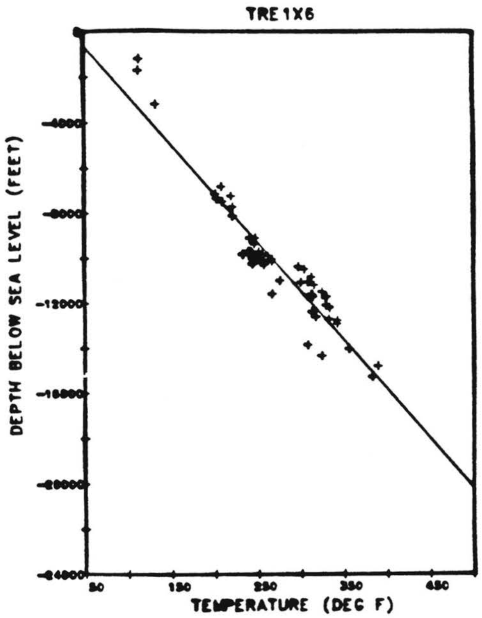
350
450
TEMPERATURE (DEG F)


TRE1X6
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150
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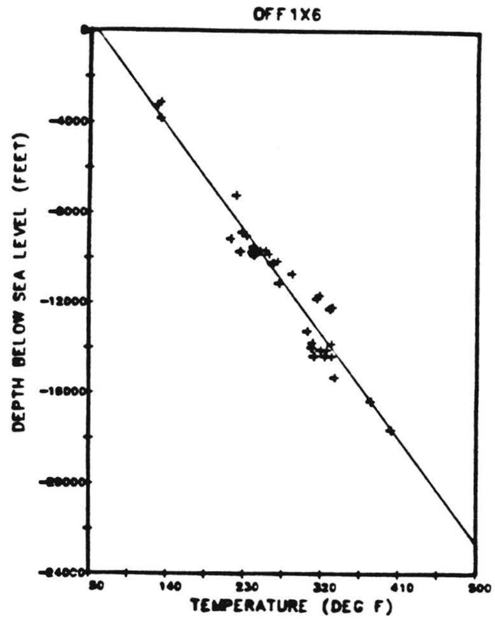
350
450
TEMPERATURE (DEG F)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50
140
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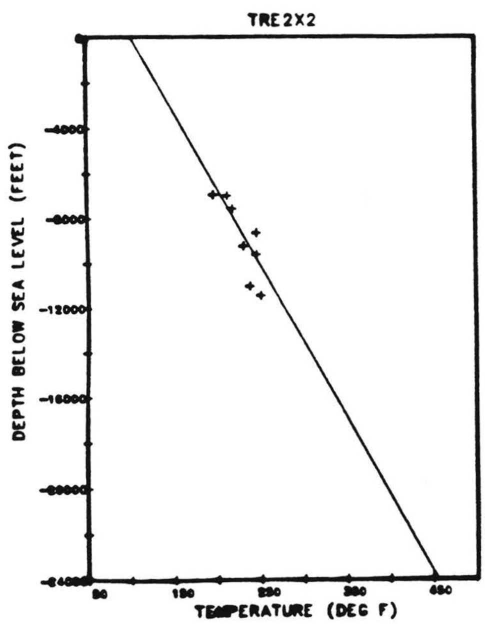
410
500
TEMPERATURE (DEG F)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350
450
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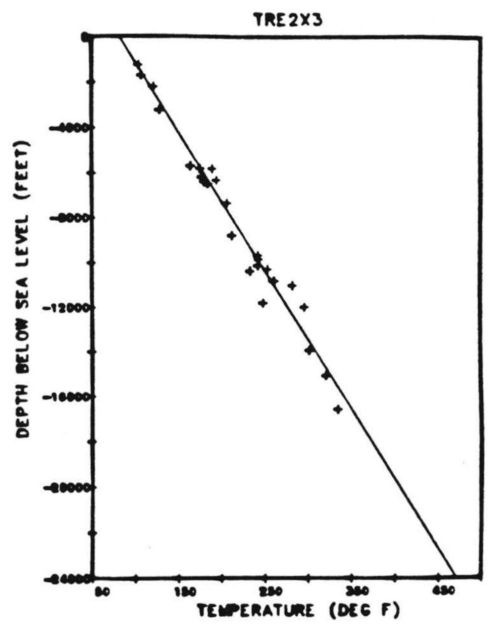
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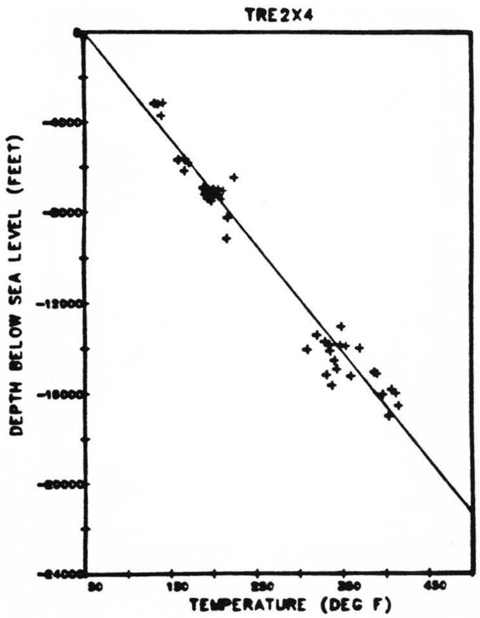
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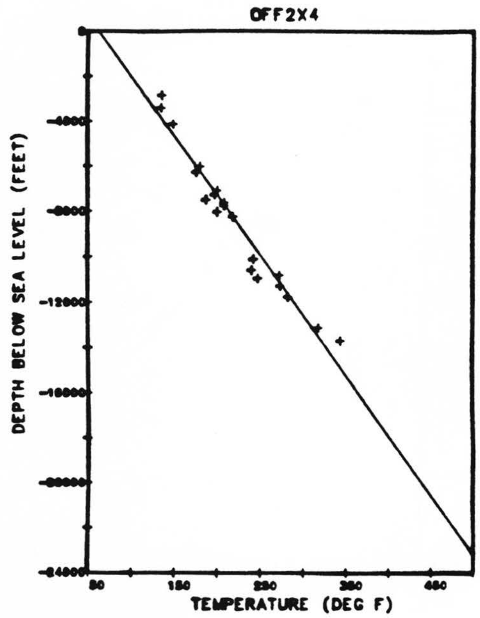
50
150
250
350
450
TEMPERATURE (DEG F)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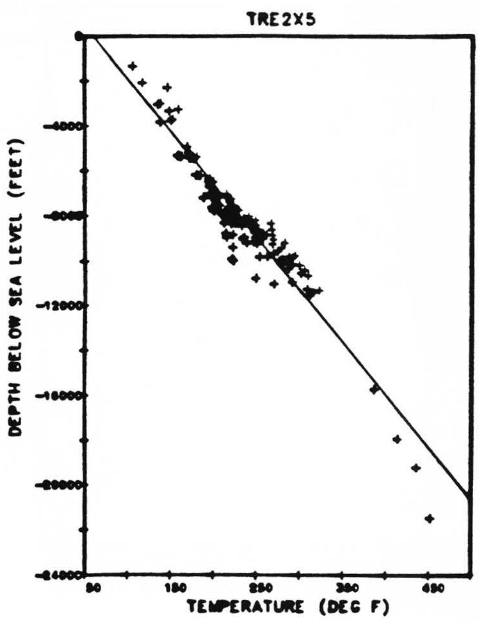
450
TEMPERATURE (DEG F)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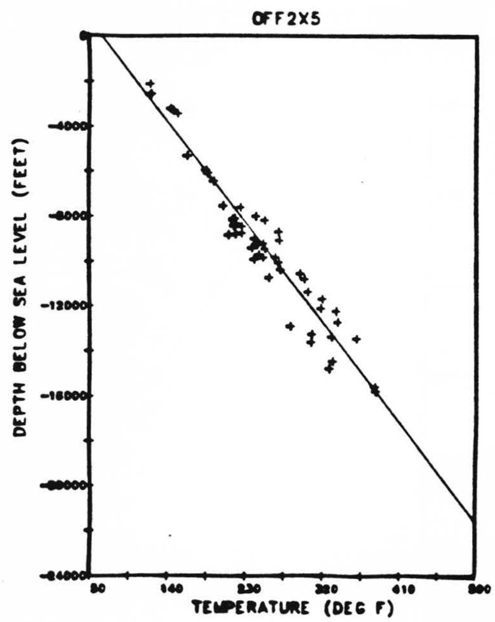
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)


OFF2X5
DEPTH BELOW SEA LEVEL (FEET)
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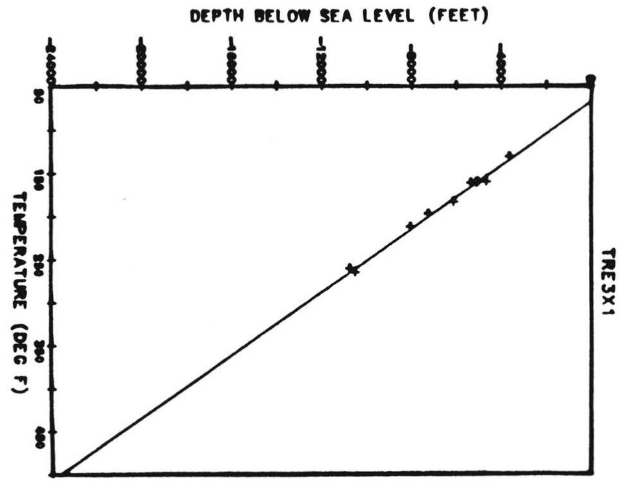
-24000
50
140
230
320
410
500
TEMPERATURE (DEG F)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TEMPERATURE (DEG F)
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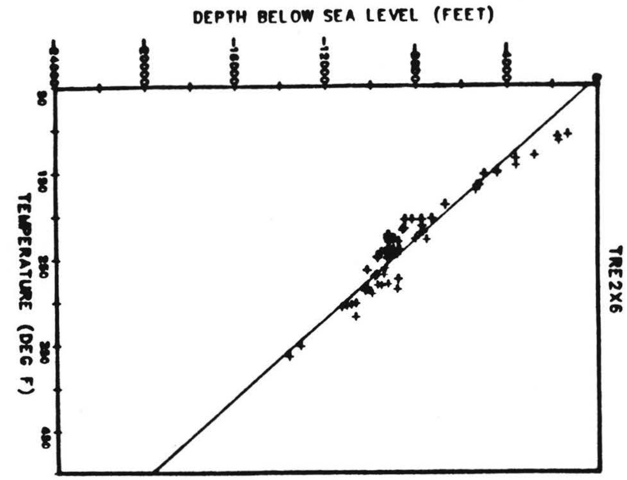
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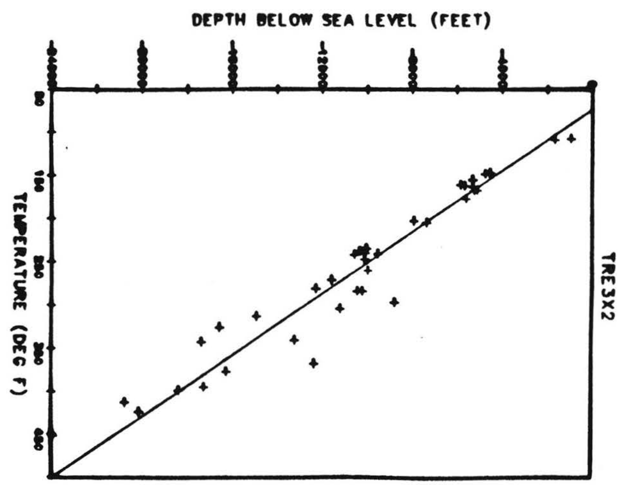
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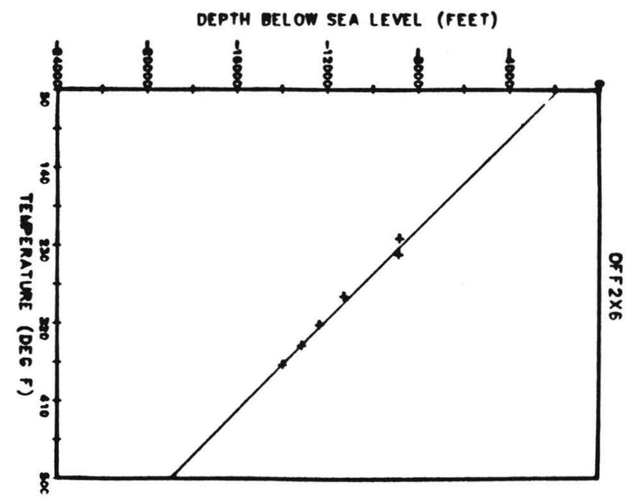
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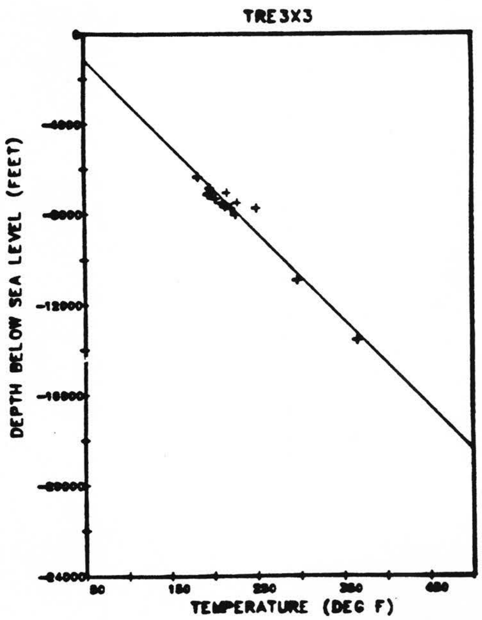
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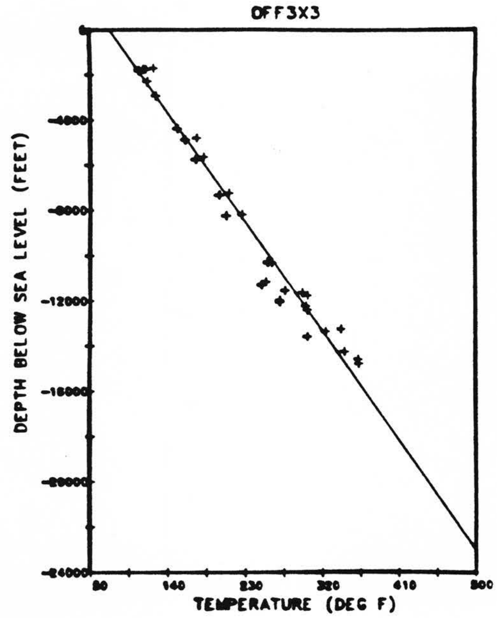
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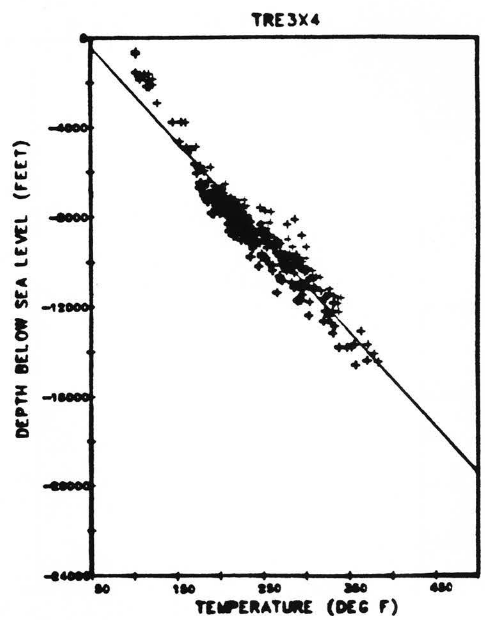
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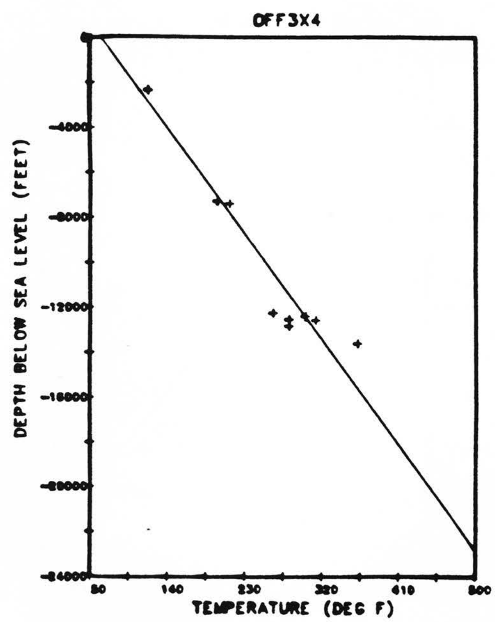
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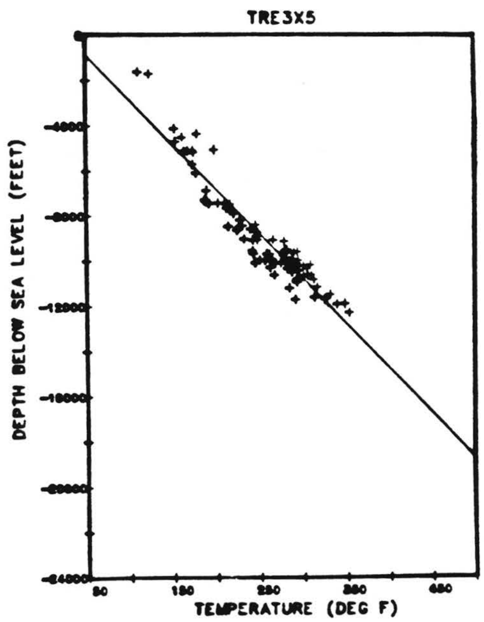
TEMPERATURE (DEG F)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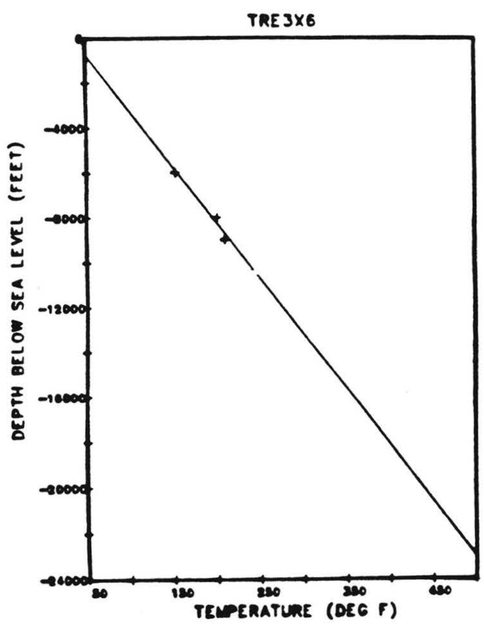
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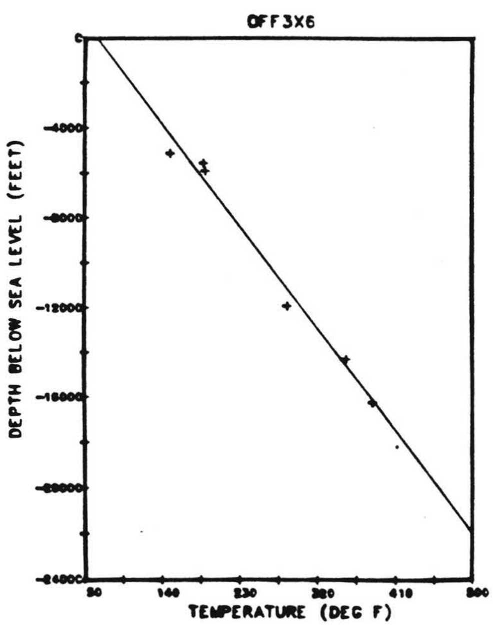
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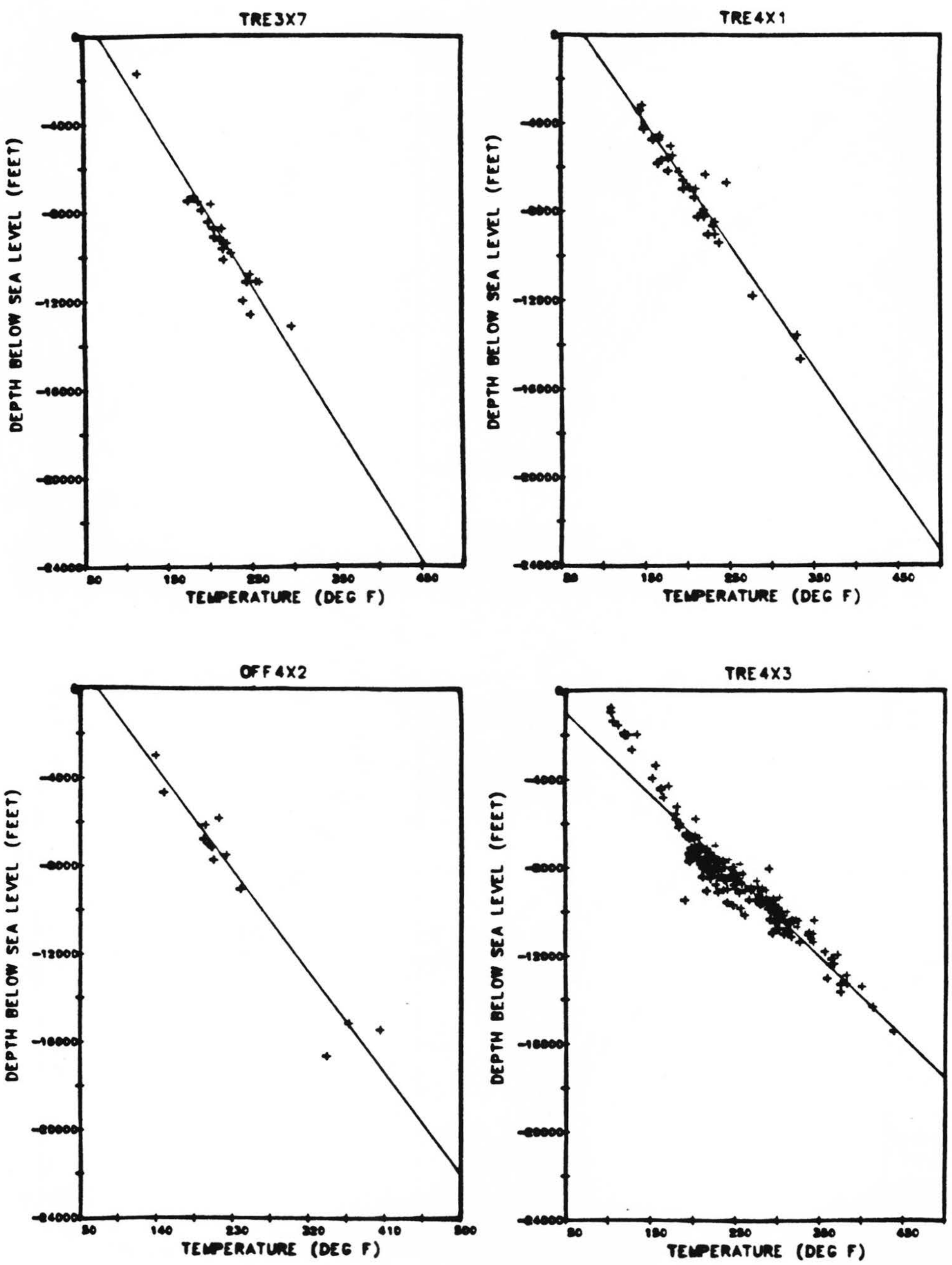
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TEMPERATURE (DEG F)
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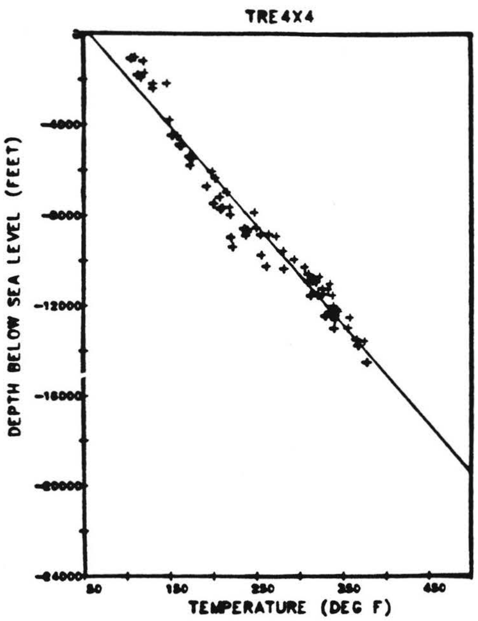
TEMPERATURE (DEG F)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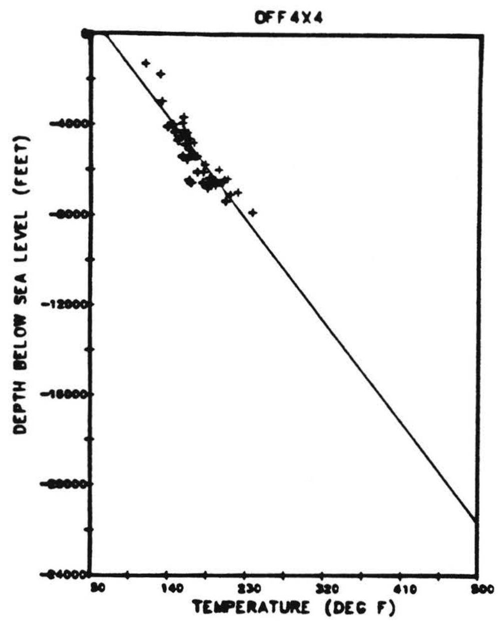
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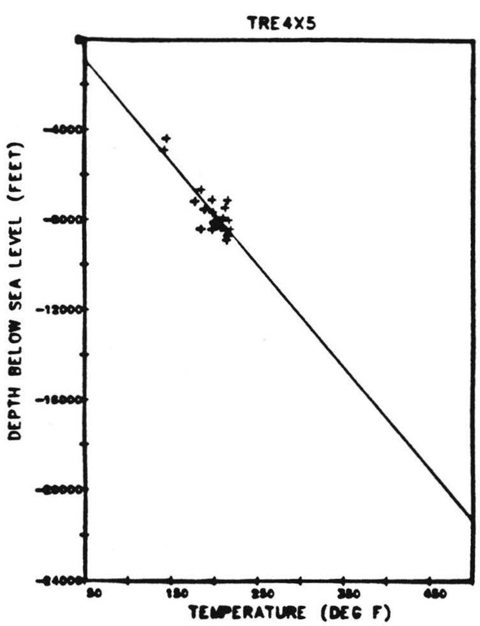
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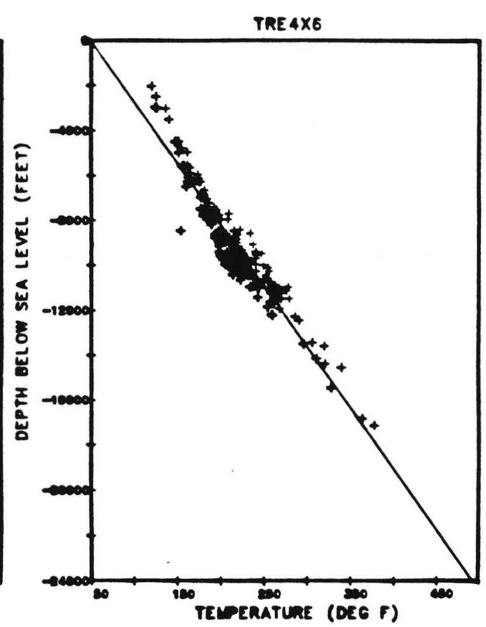
TEMPERATURE (DEG F)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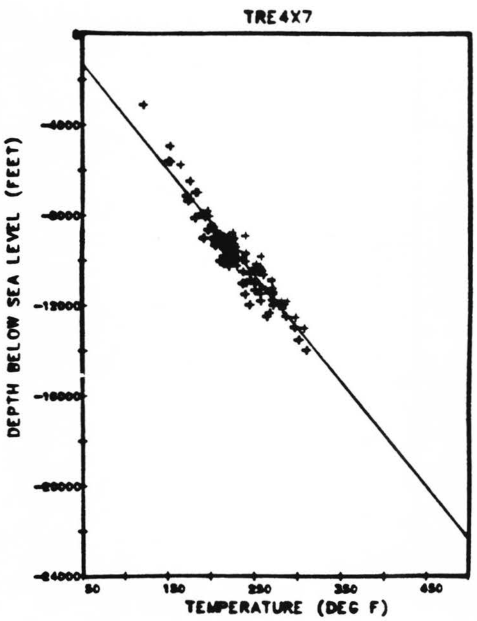
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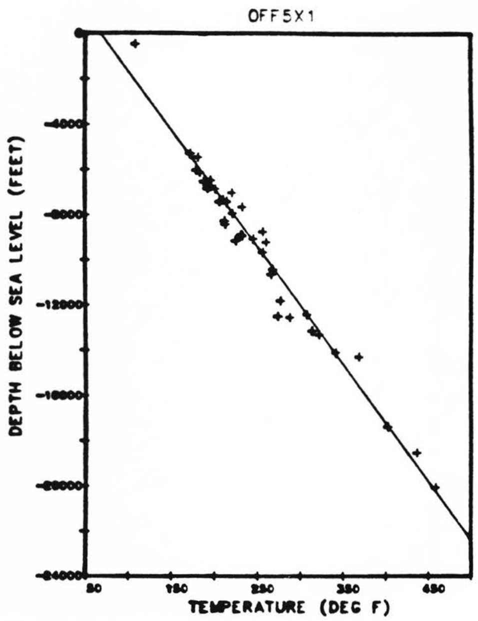
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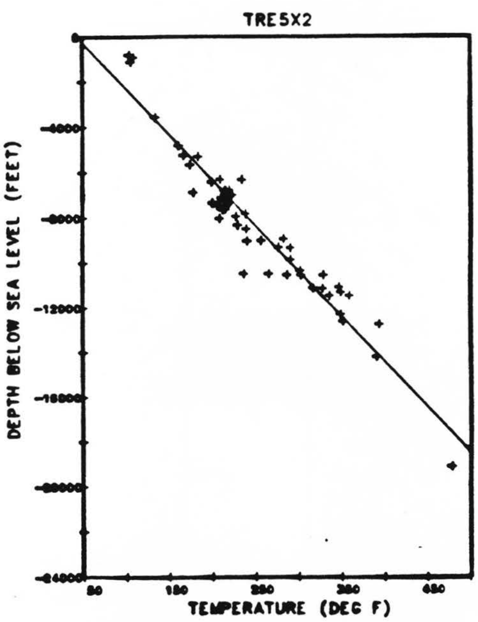
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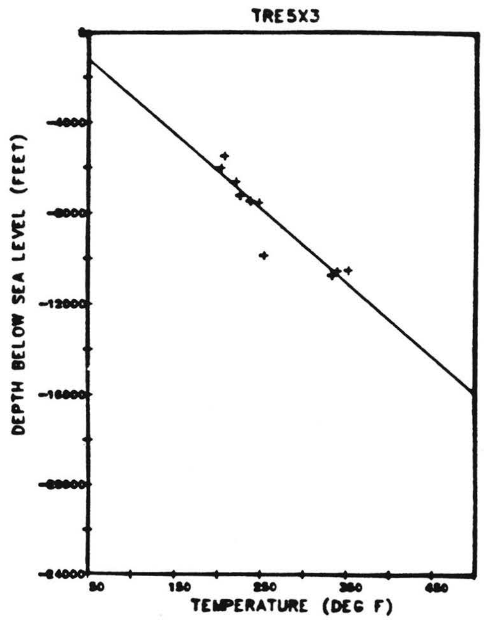
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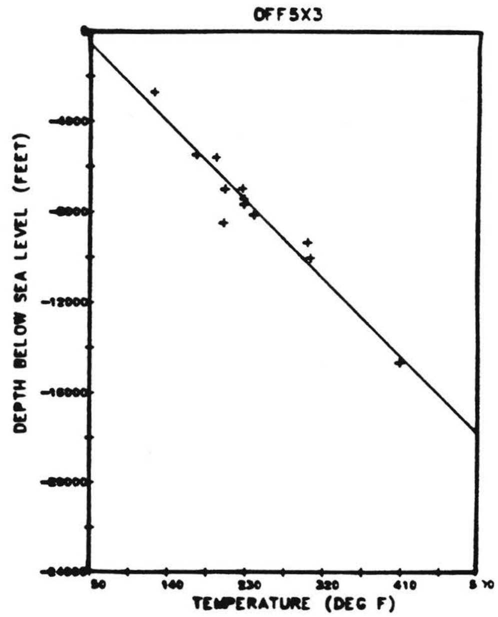
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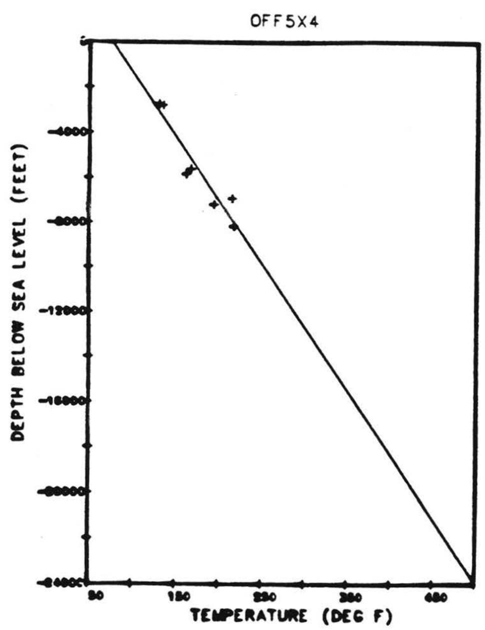
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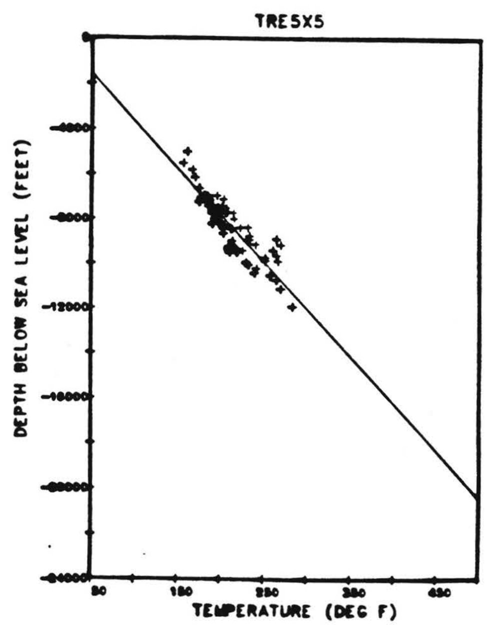
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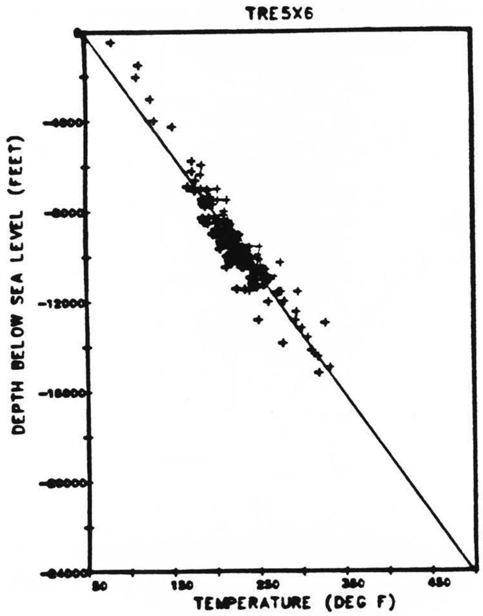
TEMPERATURE (DEG F)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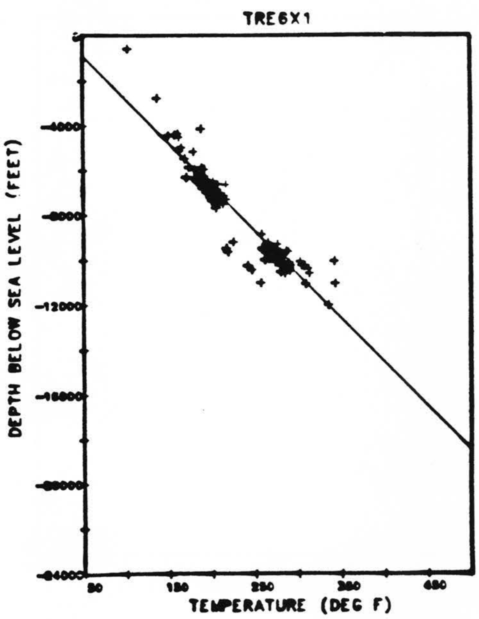
-24000
50
150
250
350
450
TEMPERATURE (DEG F)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DEPTH BELOW SEA LEVEL (FEET)
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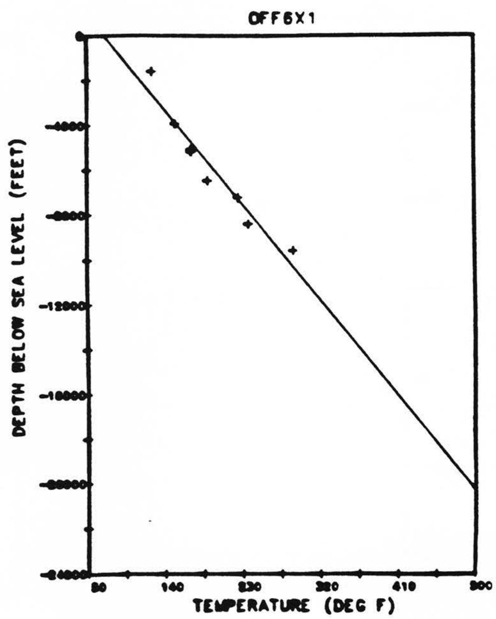
-16000
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)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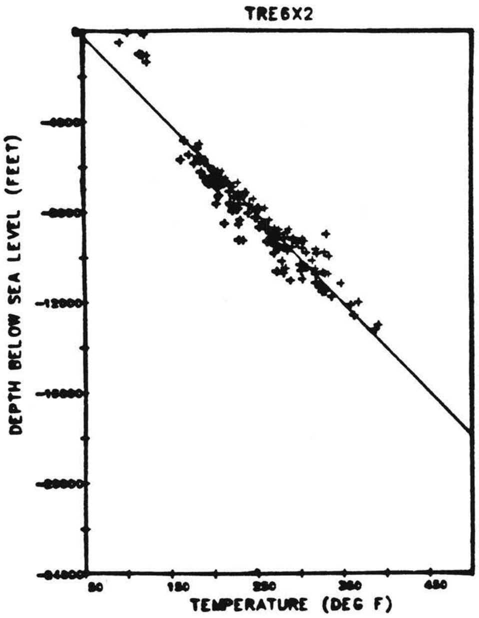
-20000
-24000
50
140
230
320
410
500
TEMPERATURE (DEG F)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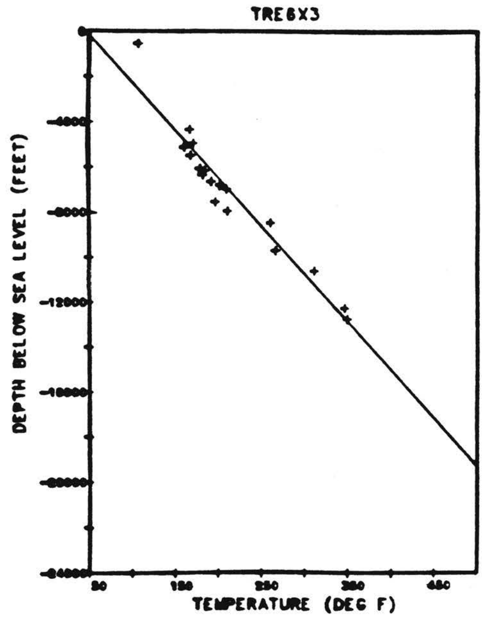
TEMPERATURE (DEG F)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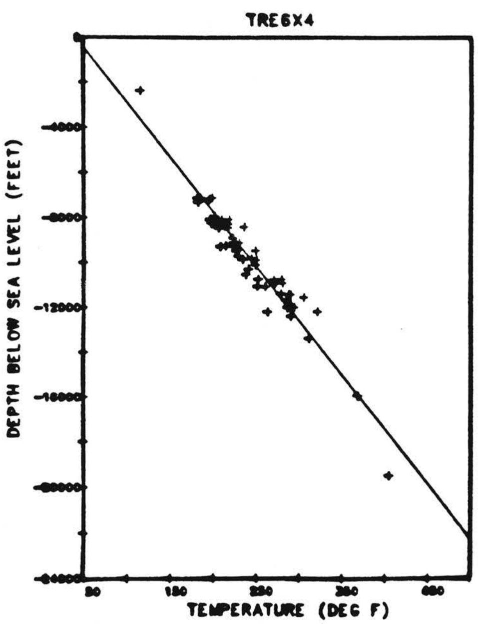
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)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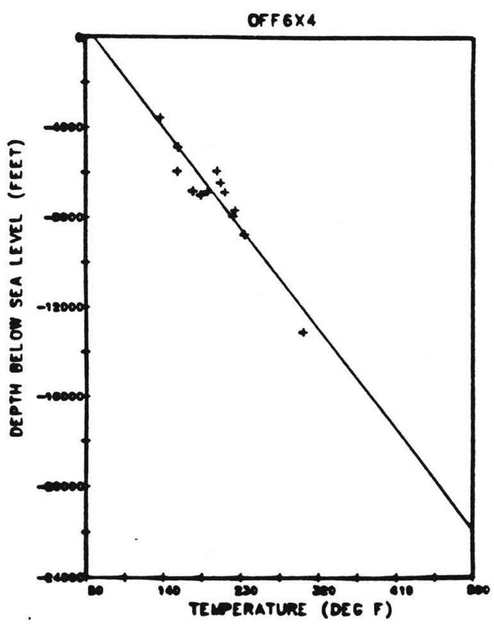
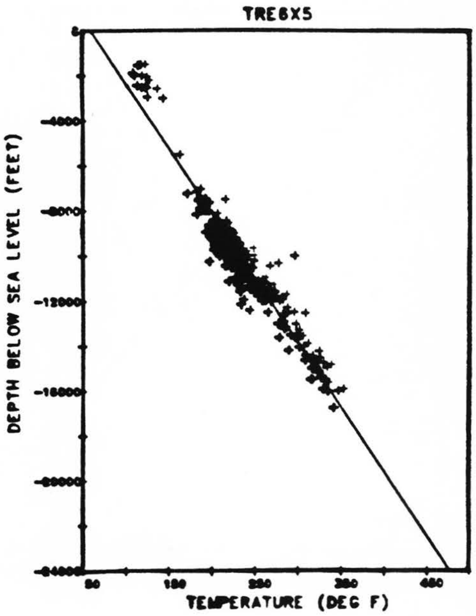
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


OFF6X4
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)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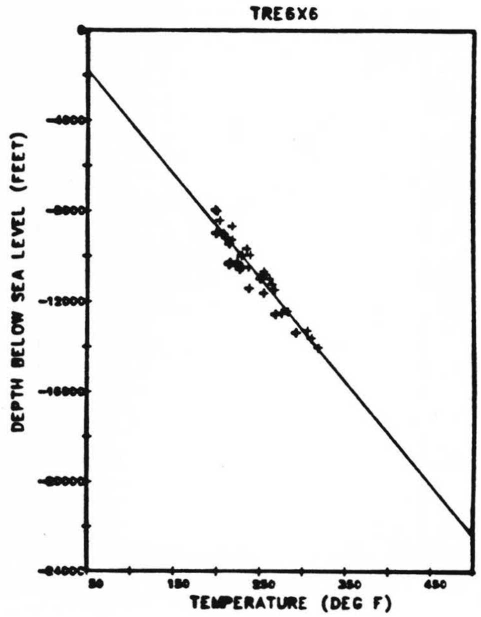
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)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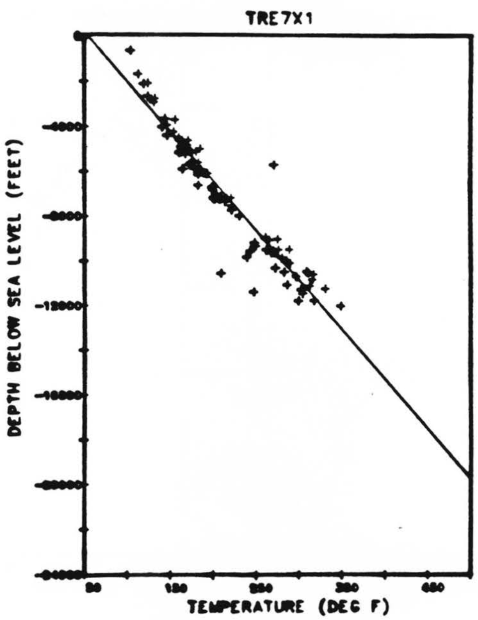
TEMPERATURE (DEG F)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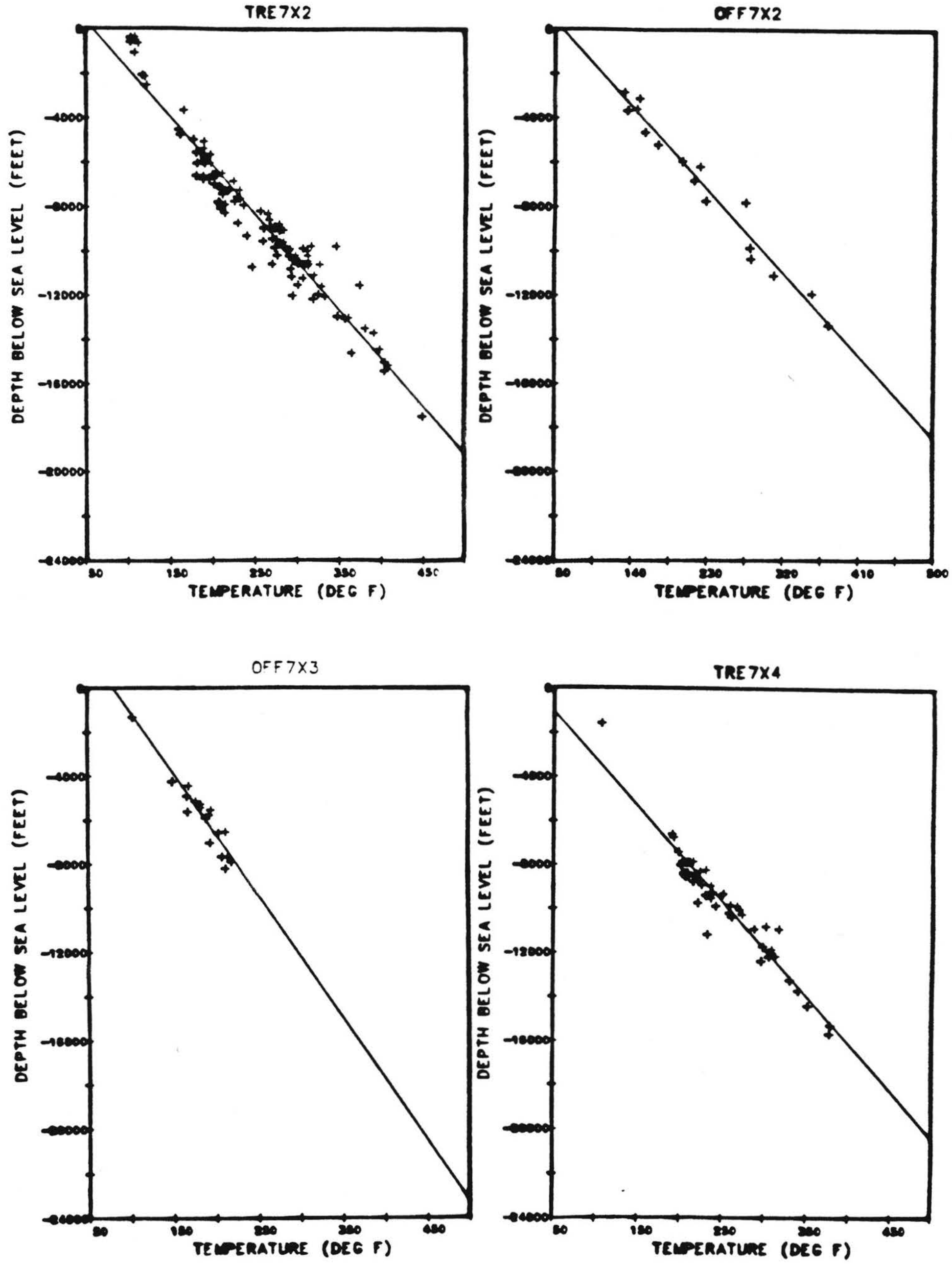
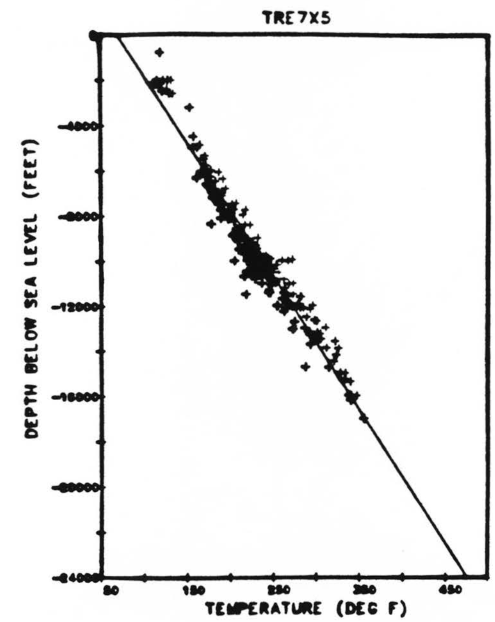
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE7X2
OFF7X2
OFF7X3
TRE7X4
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE7X5
DEPTH BELOW SEA LEVEL (FEET)
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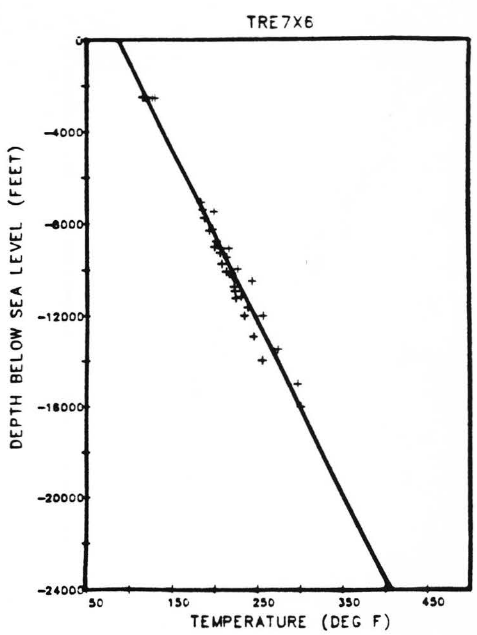
-8000
-12000
-16000
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)


TRE7X6
DEPTH BELOW SEA LEVEL (FEET)
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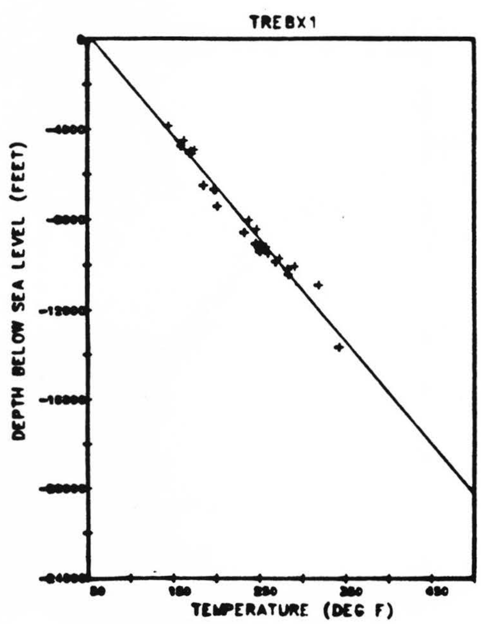
-8000
-12000
-16000
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)


TRE8X1
DEPTH BELOW SEA LEVEL (FEET)
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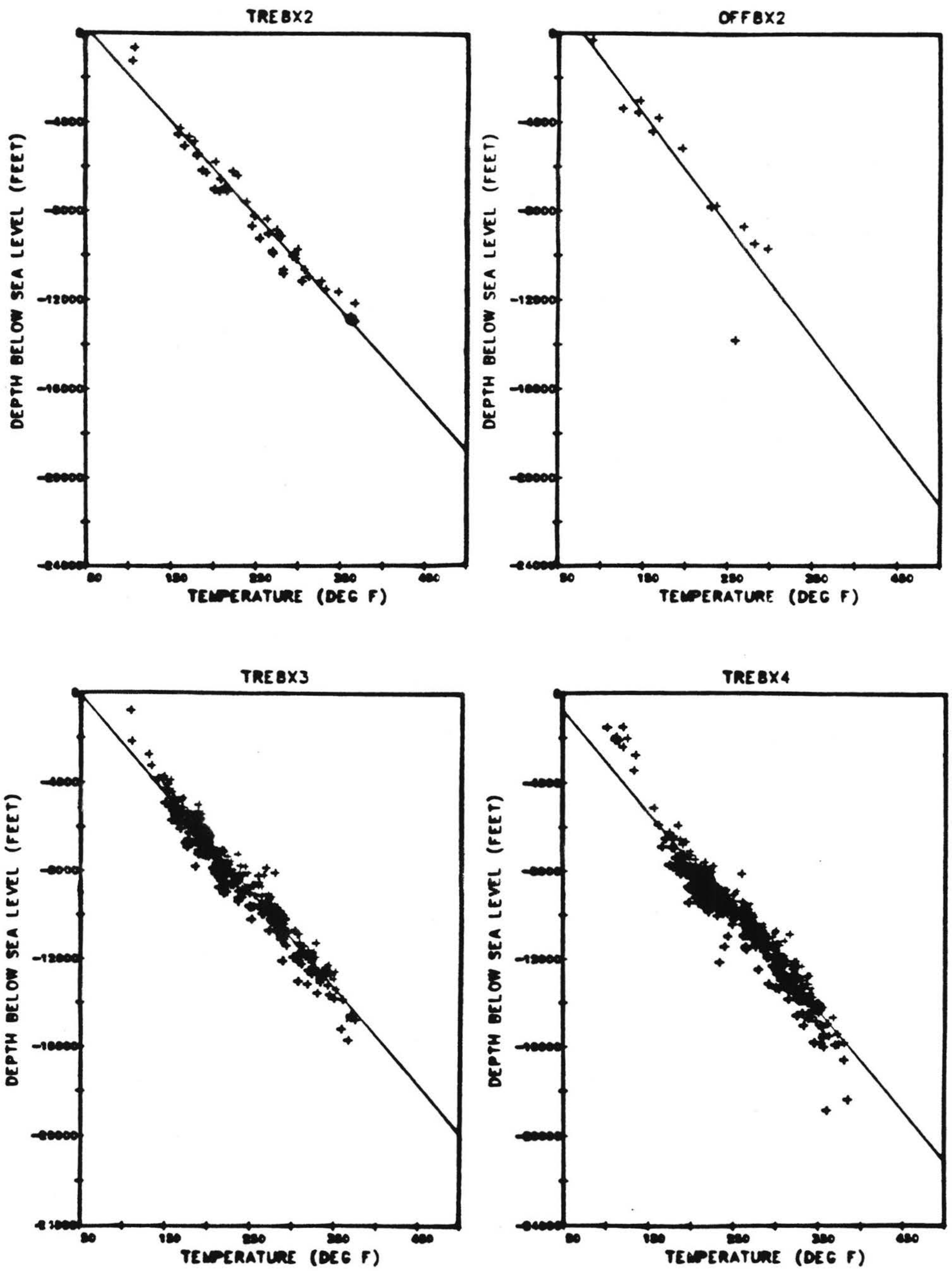
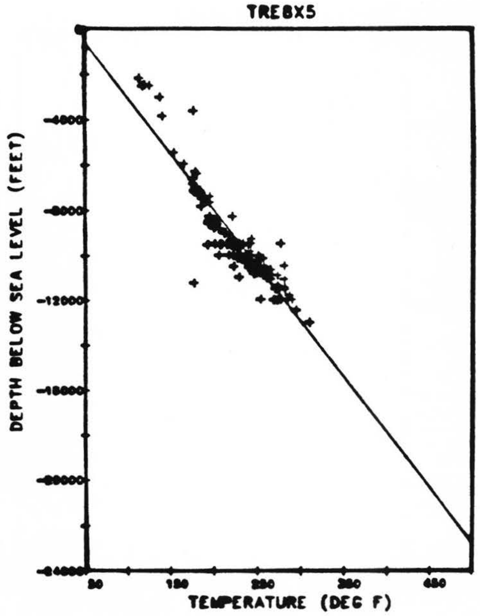
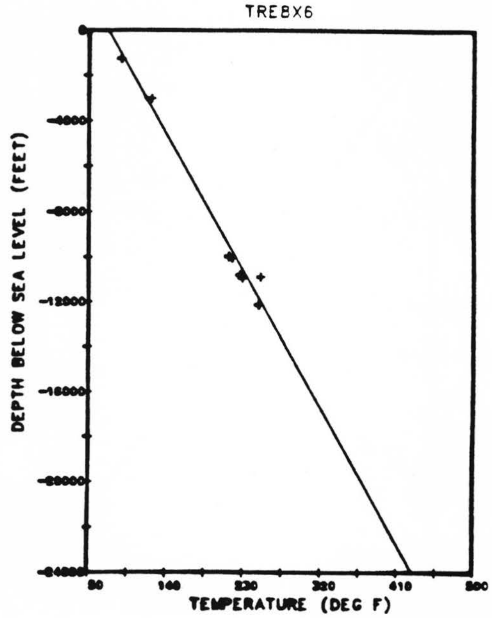
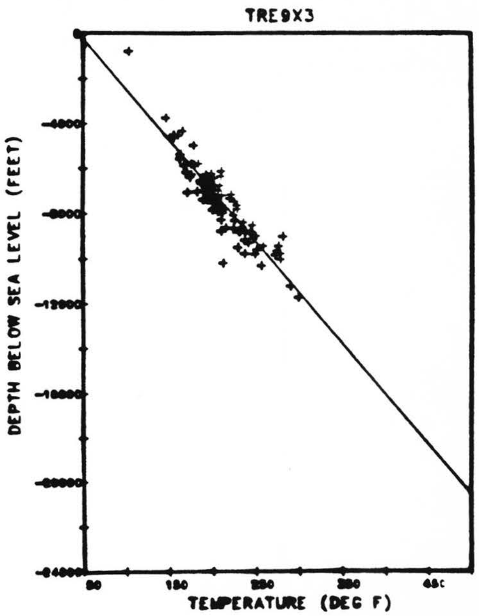
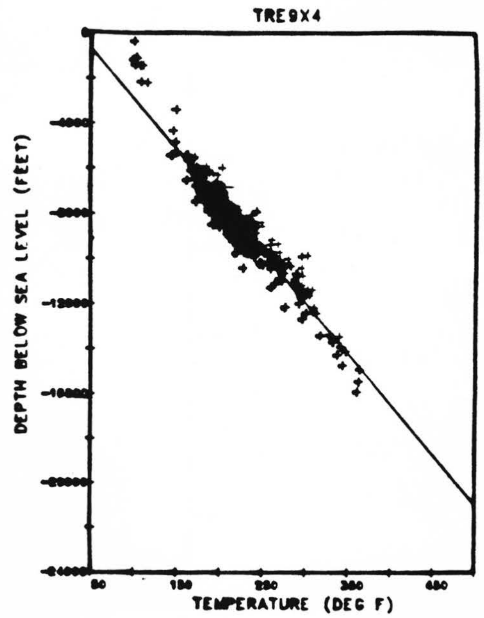
-8000
-12000
-16000
-20000
-24000
50
150
250
350
450
TEMPERATURE (DEG F)

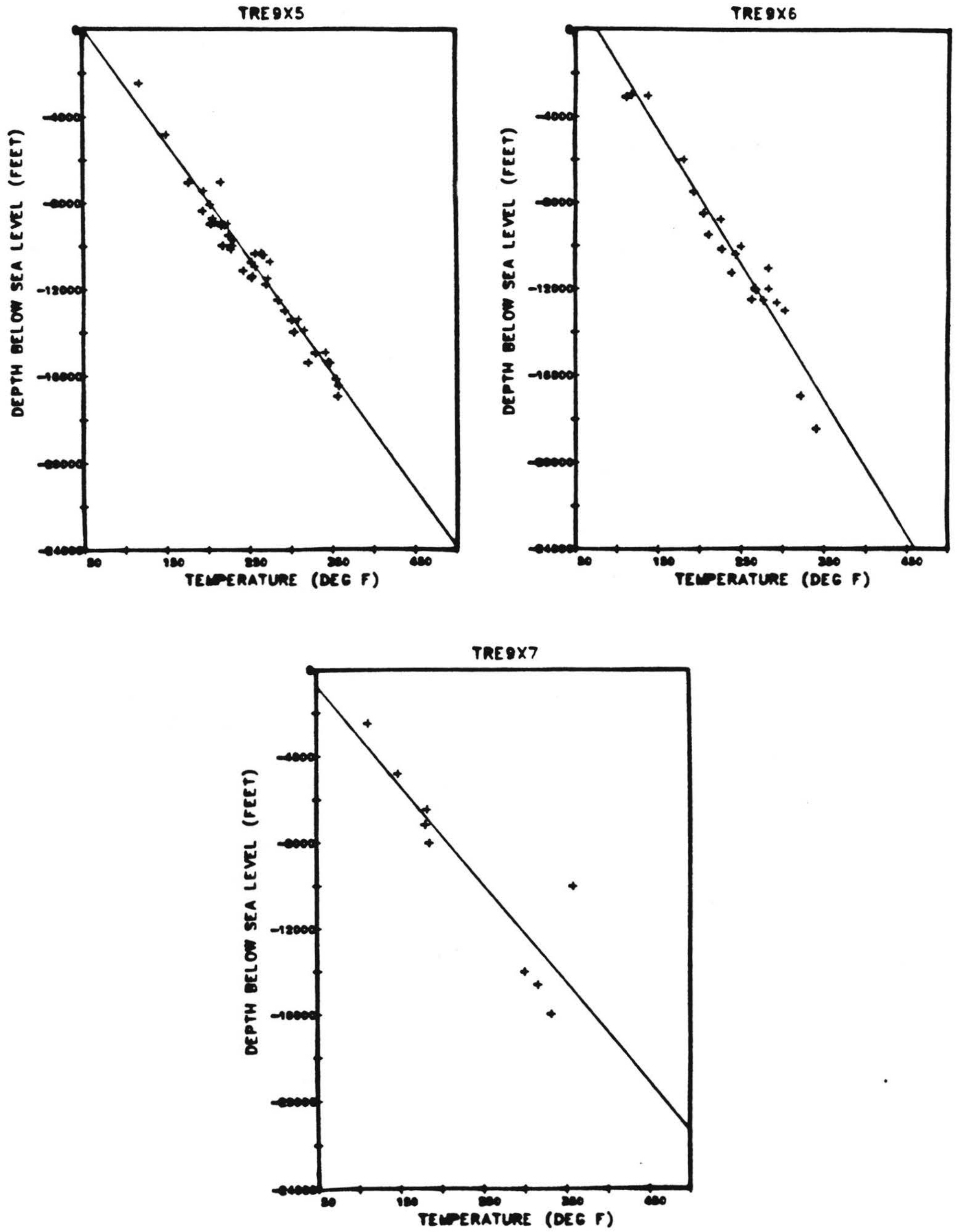

TREBX2
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)
OFFBX2
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)
TREBX3
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)
TREBX4
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE8X5
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE8X6
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE9X3
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE9X4
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)


TRE9X5
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)
TRE9X6
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)
TRE9X7
DEPTH BELOW SEA LEVEL (FEET)
TEMPERATURE (DEG F)

APPENDIX E: TEMPERATURE GRADIENTS AND THEIR CORRESPONDING CORRELATION COEFFICIENTS

Table E1. Correlation coefficients and temperature gradients of plots made over the entire depth/temperature range.

PLOT NAME	CORRELATION COEFFICIENT	TEMPERATURE GRADIENT $^{o}F/100$ FT	$^{o}C/KM$
tre1x3	-.95353	1.58	28.92
tre1x4	-.98521	1.85	33.86
tre1x5	-.96895	1.78	32.58
tre1x6	-.94638	2.30	42.09
off1x6	-.96830	1.95	35.69
tre2x2	-.79159	1.47	26.90
tre2x3	-.98680	1.62	29.65
tre2x4	-.98162	2.11	38.66
off2x4	-.97825	1.89	34.59
tre2x5	-.95719	2.13	38.98
off2x5	-.96665	2.01	36.78
tre2x6	-.95698	2.31	42.27
off2x6	-.99309	2.62	47.95
tre3x1	-.99616	1.83	33.49
tre3x2	-.96448	1.79	32.76
tre3x3	-.97673	2.59	47.40
off3x3	-.98500	1.85	33.86
tre3x4	-.95274	2.37	43.37
off3x4	-.96687	1.92	35.14
tre3x5	-.94922	2.52	46.12
tre3x6	-.98377	2.03	37.15
off3x6	-.99180	1.98	36.24
tre3x7	-.95609	1.61	29.46
tre4x1	-.96209	1.82	33.31
off4x2	-.96790	1.96	35.87
tre4x3	-.94900	2.72	49.78
tre4x4	-.97582	2.27	41.54
off4x4	-.89235	2.00	36.60
tre4x5	-.84996	2.20	40.26
tre4x6	-.95192	1.84	33.67
tre4x7	-.94903	2.14	39.16
off5x1	-.98520	1.94	35.50
tre5x2	-.96181	2.47	45.20
tre5x3	-.92459	3.05	55.82
off5x3	-.96596	2.61	47.76
off5x4	-.94730	1.77	32.39
tre5x5	-.88995	2.40	43.92

Table E1. (con't) Correlation coefficients and temperature gradients of plots made over the entire depth/temperature range.

PLOT NAME	CORRELATION COEFFICIENT	TEMPERATURE GRADIENT ^{o}F/100 FT	^{o}C/KM
tre5x6	-.94414	1.87	34.22
tre6x1	-.94249	2.56	46.85
off6x1	-.96809	2.12	38.80
tre6x2	-.94733	2.54	46.48
tre6x3	-.96666	2.35	43.01
tre6x4	-.96496	2.06	37.70
off6x4	-.93966	2.01	36.78
tre6x5	-.96171	1.74	31.84
tre6x6	-.94949	2.18	39.90
tre7x1	-.95230	2.27	41.54
tre7x2	-.96838	2.30	42.09
off7x2	-.98312	2.38	43.56
off7x3	-.94880	1.80	32.94
tre7x4	-.96208	2.32	42.46
tre7x5	-.97117	1.69	30.93
tre7x6	-.98348	1.32	24.16
tre8x1	-.98489	2.20	40.26
tre8x2	-.97634	2.36	43.19
off8x2	-.91003	1.99	36.42
tre8x3	-.97373	2.27	41.54
tre8x4	-.96097	2.21	40.44
tre8x5	-.92136	2.03	37.15
tre8x6	-.99117	1.48	27.08
tre9x3	-.91774	2.22	40.63
tre9x4	-.95061	2.22	40.63
tre9x5	-.97827	1.88	34.41
tre9x6	-.97058	1.60	29.28
tre9x7	-.88558	2.18	39.90

Table E2. Correlation coefficients and temperature gradients of plots made below the change in slope.

PLOT NAME	CORRELATION COEFFICIENT	TEMPERATURE GRADIENT $^{o}F/100$ FT	$^{o}C/KM$
tre1x6	-.90906	3.01	55.08
tre2x5	-.92839	2.28	41.73
tre2x6	-.90339	3.34	61.12
tre3x4	-.93104	2.78	50.88
tre3x5	-.92937	3.36	61.49
tre4x3	-.94326	3.37	61.67
tre4x4	-.93042	3.04	55.63
tre4x6	-.93045	2.46	45.02
tre4x7	-.92688	2.43	44.47
tre5x2	-.94961	2.84	51.97
tre5x5	-.85368	2.67	48.86
tre5x6	-.91319	2.26	41.36
tre6x1	-.88179	3.44	62.95
tre6x2	-.93753	3.01	55.09
tre6x3	-.97199	2.45	44.84
tre6x5	-.94587	2.05	37.52
tre7x1	-.87294	3.02	55.27
tre7x2	-.93665	2.68	49.05
tre7x4	-.95446	2.57	47.03
tre7x5	-.93773	2.22	40.63
tre8x2	-.90979	3.07	56.18
tre8x3	-.93916	2.48	45.39
tre8x4	-.93300	2.36	43.19
tre8x5	-.88188	2.72	49.78
tre9x3	-.87410	2.62	47.95
tre9x4	-.94384	2.42	44.29

Table E3. Correlation coefficients and temperature gradients of plots made above the change in slope.

PLOT NAME	CORRELATION COEFFICIENT	TEMPERATURE GRADIENT °F/100 FT	°C/KM
tre1x6	-.98876	1.74	31.84
tre2x5	-.95519	1.68	30.75
tre2x6	-.98864	1.50	27.45
tre3x4	-.97377	1.65	30.20
tre3x5	-.88204	1.85	33.86
tre4x3	-.98396	1.71	31.29
tre4x4	-.97132	1.73	31.66
tre4x6	-.93847	1.62	29.65
tre4x7	-.95327	1.55	28.37
tre5x2	-.93845	2.09	38.25
tre5x5	-.88669	1.89	34.59
tre5x6	-.96214	1.63	29.83
tre6x1	-.90495	1.80	32.94
tre6x2	-.96720	1.51	27.63
tre6x3	-.96638	1.49	27.27
tre6x5	-.97855	1.33	24.34
tre7x1	-.85269	2.37	43.37
tre7x2	-.96920	1.70	31.11
tre7x4	-.99449	1.65	30.20
tre7x5	-.96485	1.52	27.82
tre8x2	-.95057	2.04	37.33
tre8x3	-.89599	2.24	40.99
tre8x4	-.91544	1.89	34.59
tre8x5	-.90406	1.52	27.82
tre9x3	-.93826	1.59	29.10
tre9x4	-.95877	1.46	26.72

REFERENCES

Archer, J.S., and Wall, C.G., 1986, Petroleum engineering principles and practice: London, Graham and Trotman, 362 p.

Aziz, K., Bories, S.A., and Combarnous, M.A., 1973, The influence of natural convection in gas, oil and water reservoirs: Journal of Canadian Petroleum Technology, v. 12, p. 41-47.

Barker, C., 1972, Aquathermal pressuring-role of temperature in development of abnormal-pressure zones: American Association of Petroleum Geologists Bulletin, v. 56, no. 10, p. 2068-2071.

Bebout, D.G., Dorfman, M.H., and Agagu, O.K., 1975, Geothermal resources Frio Formation, South Texas: The University of Texas, Bureau of Economic Geology, Geological Circular 75-1, 36 p.

Bebout, D.G., Weise, B.R., Gregory, A.R., and Edwards, M.B., 1982, Wilcox sandstone reservoirs in the deep subsurface along the Texas Gulf Coast, their potential for production of geopressured geothermal energy: The University of Texas, Bureau of Economic Geology, Report of Investigations No. 117, 125 p.

Blanchard, P.E., and Sharp, J.M., Jr., 1985, Possible free convection in thick Gulf Coast sandstone sequences, in McNalty, C.L., and McPherson, J.G., eds., Transactions Southwest Section, American Association of Petroleum Geologists, Fort Worth Geological Society, p. 6-12.

Bodner, D.P., 1985, Heat variations caused by groundwater flow in growth faults of the South Texas Gulf Coast Basin: University of Texas at Austin, unpublised master's thesis, 188 p.

Bodner, D.P., Blanchard, P.E., and Sharp, J.M., Jr., 1985, Variations in Gulf Coast heat flow created by groundwater flow: Gulf Coast Association of Geological Societies Transactions, v. 35, p. 19-28.

Bodner, D.P., and Sharp, J.M.,Jr., 1988, Temperature variations in South Texas subsurface: American Association of Petroleum Geologists Bulletin, v. 72, no. 1, p. 21-32.

Bruce, C.H., 1984, Smechite dehydration-Its relation to structural development and hydrocarbon accumulation in Northern Gulf of Mexico basin: American Association of Petroleum Geologists Bulletin, v. 68, no. 6, p. 673-683.

Burst, J.F., 1969, Diagenesis of Gulf Coast clayey sediments and its possible relation to petroleum migration: American Association of Petroleum Geologists Bulletin, v. 53, no. 1, p. 73-93.

Byerly, G.R., 1988, Igneous activity, in Salvador, A., ed., The Gulf of Mexico Basin, Decade of North American Geology, (in press).

Chapman, D.S., Keho, T.H., Bauer, M.S., and Picard, M.D., 1984, Heat flow in the Uinta Basin determined from BHT data: Geophysics, v. 49, no. 4, p. 453-466.

Dickinson, G., 1953, Geological aspects of abnormal reservoir pressures in Gulf Coast Louisiana: American Association of Petroleum Geologists Bulletin, v. 37, no. 2, p. 410-432.

Dott, R.H., Jr., and Batten, R.L., 1981, Evolution of the Earth: New York, McGraw-Hill, 573 p.

Dow, W.G., 1978, Petroleum source beds on continental slopes and rises: American Association of Petroleum Geologists Bulletin, v. 62, no. 9, p. 1584-1606.

Dowdle, W.L., and Cobb, W.M., 1975, Static formation temperature from well logs-an empirical method: Journal of Petroleum Technology, v. 27, no. 11, p. 1326-1330.

Doyle, J.D., 1976, Depositional patterns of the Miocene along the middle Texas coastal plain: University of Texas at Austin, unpublished master's thesis, 111 p.

Ewing, T.E., 1986, Balcones volcanoes in South Texas: Exploration methods and examples, in Stapp, W.L., ed., Contributions to the geology of South Texas, South Texas Geological Society, p. 368-379.

Ewing, T.E., and Caran, S.C., 1982, Late Cretaceous volcanism in South and Central Texas-stratigraphic, structural and seismic models: Gulf Coast Association of Geological Societies Transactions, v. 32, p. 137-145.

Fertl, W.H., and Wichmann, P.A., 1977, How to determine static BHT from well log data: World Oil, v. 184, no. 1, p. 105-106.

Fogg, G.E., and Kreitler, C.W., 1982, Groundwater hydraulics and hydrochemical facies in Eocene aquifers of the East Texas Basin: The University of Texas, Bureau of Economic Geology, Report of Investigations No. 124, 31 p.

Freeman, P.S., 1966, Clastic diapirism in the Gueydan Formation: University of Texas at Austin, unpublished master's thesis, 198 p.

Galloway, W.E., 1982, Epigenetic zonation and fluid flow history of uranium-bearing fluvial aquifer systems, South Texas Uranium Province: The University of Texas, Bureau of Economic Geology, Report of Investigations No. 119, 31 p.

Galloway, W.E., 1984, Hydrogeologic regimes of sandstone diagenesis, in McDonald D.A., and Surdham, R.C., eds., Clastic Diagenesis, American Association of Petroleum Geologists Memoir 37, p. 3-13.

Galloway, W.E., and Hobday, D.K., 1983, Terrigenous clastic depositional systems: Applications to petroleum, coal, and uranium exploration: New York, Springer-Verlag, 423 p.

Galloway, W.E., Jirik, L.A., Morton, R.A., and DuBar, J.A., 1986, Lower Miocene (Fleming) depositional episode of the Texas coastal plain and continental shelf: Structural framework, facies, and hydrocarbon resources: The University of Texas, Bureau of Economic Geology, Report of Investigations No. 150, 50 p.

Glaser, S., and Hurtig, E., 1984, The establishment of the thermal equilibrium in a deep bore hole in the northern part of the German Democratic Republic: Tectonophysics, v. 103, no. 1-4, p. 47-54.

Gretener, P.E., 1981, Geothermics: Using temperature in hydrocarbon exploration: American Association Petroleum Geologists Education Course Note Series No. 17, 170 p.

Guyod, H., 1946, Temperature well logging: Part 2. Salt intrusions: The Oil Weekly, October 28, p. 33-42.

Hedberg, H.D., 1980, Methane generation and petroleum migration, in Roberts, W.H., III, and Cordell, R.J., eds., Problems of Petroleum

Migration, American Association of Petroleum Geologists, Studies in Geology no. 10, p. 179-206.

Henry, C.D., and McDowell, F.W., 1986, Geochronology of magmatism in the Tertiary volcanic field, Trans-Pecos Texas, in Price, J.G., Henry, C.D., Parker, D.F., and Barker, D.S., eds., Igneous geology of Trans-Pecos Texas, field trip guide and research articles: The University of Texas, Bureau of Economic Geology, Guidebook 23, p. 99-122.

Imlay, R.W., 1980, Jurassic paleobiography of the conterminous United States in its continental setting: U.S. Geological Survey Professional Paper 1062, 134 p.

Jones, P.H., 1969, Hydrodynamics of geopressure in the Northern Gulf of Mexico Basin: Journal of Petroleum Technology, v. 21, no. 7, p. 803-810.

Jones, P.H., 1970, Geothermal resources of the northern Gulf of Mexico Basin: Geothermics-special issue, U.N. Symposium on the Development and Utilization of Geothermal Resources, v. 2, part 1, p. 14-26.

Jorden, J.R., and Campbell, F.L., 1984, Well logging I-Rock properties, borehole environment, mud and temperature logging: Society of Petroleum Engineers, Monograph volume 9, Henry L. Doherty Series, 167 p.

Keen, C.E., 1983, Salt diapirs and thermal maturity: Scotia Basin: Bulletin of Canadian Petroleum Geology, v. 31, p. 101-108.

Kehle, R.O., 1971, Geothermal survey of North America, 1971 Annual Progress Report: Research Committee American Association of Petroleum Geologists (unpublished), 31 p.

Knudsen, H.P., and Kim, Y.C., 1978, A short course on geostatistical ore reserve estimation: University of Arizona-Tucson, Department of Mining and Geological Engineering, 267 p.

Land, L.S., 1984, Diagenesis of Frio sandstones, Texas Gulf Coast: a regional isotopic study, in McDonald, D.A., and Surdham, K.C. , eds., Clastic Diagenesis, American Association of Petroleum Geologists Memoir 37, p. 37-62.

Land, L.S., Milliken, K.L., and McBride, E.F., 1987, Diagenetic evolution of Cenozoic sandstones, Gulf of Mexico sedimentary basin:

Sedimentary Geology, v. 50, p. 195-225.

LeBlanc, V., Pascoe, L.J. and Jones, F.W., 1981, The temperature stabilization of a borehole: Geophysics, v. 46, no. 9, p. 1301-1303.

Lewis, C.R., and Rose, S.C., 1970, A theory relating high temperatures and overpressures: Journal of Petroleum Technology, v. 22, no. 1, p. 11-16.

Loucks, R.G., 1979, Sandstone distribution and potential for geopressured geothermal energy production in the Vicksburg Formation along the Texas Gulf Coast: The University of Texas, Bureau of Economic Geology, Geological Circular 79-4, 32 p.

Majorowicz, J.A., Jones, F.W., Lam, H.L., and Jessop, A.M.,1984, Variability of heat flow both regional and with depth in southern Alberta, Canada; Effect of groundwater flow?: Tectonophysics, v. 106, no. 1-2, p. 1-29.

Martin, R.G., 1978, Northern and eastern Gulf of Mexico continental margin: Stratigraphic and structural framework, in Bouma, A.H., Moore, G.T., and Coleman, J.M., eds., Framework, facies, and oil-trapping characteristics of the upper continental margin, American Association of Petroleum Geologists, Studies in Geology no. 7, p. 21-42.

Merrill, G.K., 1986, Map location literacy-How well does Johnny Geologist read?: Geological Society of America Bulletin, v. 97, p. 404-409.

Middleton, M.F., 1979, A model for bottom-hole temperature stabilization: Geophysics, v. 44, no. 8, p. 1458-1462.

Morton, R.A., Garrett, C.M., Jr., Posey, J.S., Han, J.H., and Jirik, L.A., 1981, Salinity variations and chemical compositions of waters in the Frio Formation, Texas Gulf Coast: The University of Texas at Austin, Bureau of Economic Geology, report prepared for U.S. Department of Energy, contract no. DE-AC08-79ET27111, 96 p.

Morton, R.A., Garrett, C.M., Jr., and Posey, J.S., 1983, Variations in chemical compositions of Tertiary formation waters, Texas Gulf Coast, in Morton, R.A., Ewing, T.E., Kaiser, W.R., and Finley, R.J., eds., Consolidation of geologic studies of geopressured geothermal resources in Texas, The University of Texas at Austin, Bureau of Economic Geology, report prepared for U.S. Department of Energy, contract no. DE-AC08-79ET27111, p. 63-136.

Morton, R.A., and Land, L.S., 1987, Regional variations in formation water chemistry, Frio Formation (Oligocene), Texas Gulf Coast: American Association of Petroleum Geologists Bulletin, v. 71, no. 2, p. 191-206.

Norris, R.J., and Henley, R.W., 1976, Dewatering of a metamorphic pile: Geology, v. 4, p. 333-336.

North, F.K., 1985, Petroleum geology: Boston, Allen and Unwin, 607 p.

Nunn, J.A., 1984, Subsidence and temperature histories for Jurassic sediments in the Northern Gulf Coast: A thermal mechanical model, in Ventress, W.P.S., Bebout, D.G., Perkins, B.F., and Moore, C.H., eds., The Jurassic of the gulf rim, GCSSEPM Foundation Third Annual Research Conference Proceedings, p. 309-322.

Nwachukwu, S.O., 1976, Approximate geothermal gradients in Niger Delta sedimentary basin: American Association of Petroleum Geologists Bulletin, v. 60, no. 7, p. 1073-1077.

Pilkington, P.E., 1988, Uses of pressure and temperature data in exploration and new developments in overpressure detection: Journal of Petroleum Technology, v. 40, no. 5, p. 543-549.

Pindell, J.L., 1985, Alleghenian reconstruction and susequent evolution of the Gulf of Mexico, Bahamas, and Proto-Caribbean: Tectonics, v. 4, no. 1, p. 1-39.

Posey, J.S., 1986, The Louann Salt of the Gulf Coast Basin, with emphasis on South Texas, in Stapp, W.L., ed., Contributions to the geology of South Texas, South Texas Geological Society, p. 440-446.

Prats, M., 1982, Thermal recovery: Society of Petroleum Engineers, Monograph volume 7, Henry L. Doherty series, 283 p.

Rainwater, E.H., 1967, Resume of Jurassic to recent sedimentation history of the Gulf of Mexico basin: Gulf Coast Association of Geological Societies Transactions, v. 17, p. 179-210.

Roux, B., Sanyal, S.K., and Brown, S.L., 1980, An improved approach to estimating true reservoir temperature from transient temperature data: Society of Petroleum Engineers paper 8888, presented at the 1980 SPE California Regional Meeting-Los Angeles, 8 p.

Seyfert, C.K., and Sirken, L.A., 1979, Earth history and plate tectonics: An introduction to historical geology: New York, Harper and Row, 600 p.

Sharp, J.M., Jr., and Domenico, P.A., 1976, Energy transport in thick sequences of compacting sediment: Geological Society of America Bulletin, v. 87, p. 390-400.

Sharp, J.M., Jr., Galloway,W.E., Land, L.S., McBride, E.F., Blanchard, P.E., Bodner, D.P., Dutton, S.P., Farr M.R., Gold, P.B., Jackson, T.J., Lundegard, P.D., Milliken, K.L., and Macpherson, G.L., 1988, Diagenetic processes in Northwest Gulf of Mexico sediments: New York, Elsevier, (in press).

Speece, M.A., Bowen, T.D., Folcik, J.L., and Pollack, H.N., 1985, Analysis of temperatures in sedimentary basins: the Michigan Basin: Geophysics, v. 50, no. 8, p. 1318-1334.

Stanley, S.M., 1986, Earth and life through time: New York, W.H. Freeman and Company, 689 p.

Straus, J.M., and Schubert, G.,1977, Thermal convection of water in a porous medium: Effects of temperature-and-pressure-dependent thermodynamic and transport properties: Journal of Geophysical Research, v. 82, p. 325-333.

Tyler, N., Light, M.P.R., and Ewing, T.E., 1985, Saline fluid flow and hydrocarbon migration and maturation as related to geopressure, Frio Formation, Brazoria County, Texas, in Dorfman, M.H., and Morton, R.A., eds., Geopressured-geothermal energy proceedings of the Sixth U.S. Gulf Coast geopressured-geothermal energy conference, p. 83-92.

Woodruff, C.M., Jr., and Foley, D., 1985, Thermal regimes of Balcones-Ouachita Trend, Central Texas [abs.]: American Association of Petroleum Geologists Bulletin, v. 69, no. 9, p. 1431.

Young, A., Monaghan, P.H., and Schweisberger, R.T., 1977, Calculation of ages of hydrocarbons in oils-Physical chemistry applied to petroleum geochemistry 1: American Association of Petroleum Geologists Bulletin, v. 61, no. 4, p. 573-600.

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Plate 1. Well location map of the entire study area.

WELL LOCATION MAP FOR THE ENTIRE DATA SET SOUTH TEXAS 9 JUN 1988

1.400+4